Mines and Metallurgy Library

The Monthly Evening Sky Map

A JOURNAL FOR THE AMATEUR — FOUNDED BY THE LATE LEON BARRITT
—NORTHERN AND SOUTHERN HEMISPHERE—
ALSO A STAR, CONSTELLATION AND PLANET FINDER MA
ARRANGED FOR THE CURRENT MONTHS—JULY-AUG.-SEP
MORNING AND EVENING—AND PRACTICAL ANYWHERE
THE WORLD PUBLISHED QUARTERL

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Largest Circulation of any Amateur Astronomical Journal in the World

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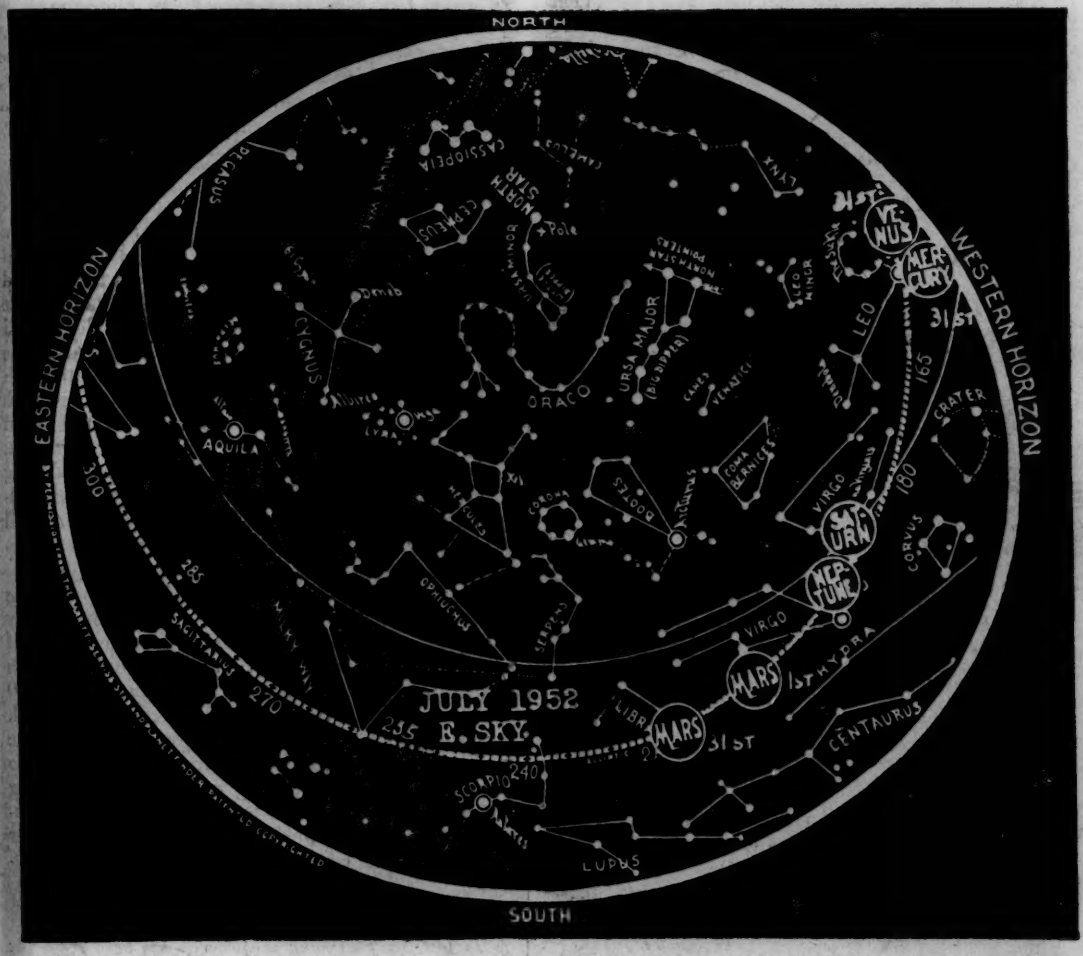
EVENING SKY MAP FOR JULY



Face South And Hold The Map Overhead. The Top North And You Will See The Stars And Planets Just As They Appear In The Heavens. The Arrow Through The Two Stars In The Bowl Of The Big Dipper Points To The North Star. The Star At The End Of The Little Dipper.

AT 9:00 P.M., JULY 1; 8:00 P.M., JULY 15; 6:30 P.M., JULY 31.

This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitude in Europe.

XUM

"The Coming Conquest of Space"

"The Coming Conquest of Space" was written in 1946 by Harry Akers, Jr., at the age of 12½, as a social science assignment in Balboa Junior High School, Balboa Heights, Canal Zone. It was first published in the Monthly Evening Sky Map in 1946-1948. In 1952, the author, now a student at Colorado School of Mines, Golden, Colorado, at the request of the editors of the MONTHLY EVENING SKY MAP, revised and enlarged the article by means of foot notes. The original text appears in normal type, the recently-added foot notes in italic type.

A TRIP TO THE MOON

(Continued from last issue)

After we have checked everything, we are ready to begin our exploration of space. Our nearest neighbor is the Moon, and since it is never more than 252,000 miles away, and sometimes as close as 221,000 miles, while our nearest planet neighbor, Venus, is seldom closer than about 26,000,000 miles, it is evident that we will be going to the Moon on our first space-voyage. The best time to go would be near new moon, when the Moon is between the Earth and the Sun. Its pull is then reinforced by that of the Sun behind it, and we would be going towards the Sun instead of away from it - against its gravitational pull. If we went near full moon, a speed slightly higher than the Earth's velocity of escape would be necessary because of the Sun's pull.

The most economical plan for a Lunar voyage would be to fail to reach the full value of the Earth's velocity of escape. Thus the neutral point *would be passed at a speed of nearly zero, possibly only a few miles per hour. The neutral is the point between the Earth and the Moon, about* 24,000 *miles from the Moon, at which the attractions of the Earth and Moon are equal. The slower the neutral point is passed, the lower will be the speed of arrival on the Moon (in any event, it will be of the order of* 1.2 *m.p.s. or greater), and the less fuel will be required for braking. The neutral point* must be passed, *regardless of how great or how small a speed the rocket may have, if the rocket is to be attracted to the Moon instead of being drawn back to the Earth. If the initial speed of* 7 *m.p.s. could be maintained throughout the journey, it would require only about* 71½ *hours. However, because the Earth will be slowing the rocket down, an* over-all *average speed of* 7 *m.p.s. could be obtained only by using an initial velocity considerably in excess of* 7 *m.p.s. The plan involving passing the neutral point at a speed of almost zero requires four days for the trip. But a very slight addition to our initial velocity would greatly reduce the time required . . . and greatly increase the amount of fuel required for braking. Probably as rocket motors are improved, the time saving involved will become more important than the fuel saving; at present, however, we have unlimited* time, *while fuel is still a problem. The following figures were derived taking the neutral point as being at a distance of* 215,000 *miles from the Earth, disregarding any air resistance caused by the Earth's atmosphere during the take-off, and ignoring the effects of the Sun and the Moon. (Here, "initial velocity" should be interpreted as "speed upon leaving the atmosphere.")*

Initial velocity	(Rocket will return to Earth)
Under 6.88 *m.p.s.*	
6.88 *m.p.s.*	"Zero"
6.96 *m.p.s.*	1 *m.p.s.*
(exact value of escape velocity)	
7.00 *m.p.s.*	1 1/4 *m.p.s.*
7.5 *m.p.s.*	3 1/5 *m.p.s.*
8.0 *m.p.s.*	4 *m.p.s.*
10. *m.p.s.*	7 1/4 *m.p.s.*

Comparisons of the neutral - point passing speeds for various initial speeds clarify the statement that the duration of the trip can be greatly reduced by a "very slight addition" to the initial speed.

If this were merely a trip to the Moon and back, we would not need any extra oxygen, but, as we plan to stay till full moon (when the Earth is between the Sun and the Moon, so that we would be returning towards the Sun instead of away from it), we had better take plants and enough food to last for two or three weeks, for we will not be able to get any on the Moon!

After we have landed, we will be able to take off our magnetic shoes, for we will then have the Moon's gravity pulling on us. However, because the Moon weighs so much less than the Earth (1/81 as much), the attraction of gravity at its surface is much less - 1/6 as much. We could jump 18 feet into the "air" with as much ease as we jump three feet on Earth. A fall of 30 feet would hurt us no more than one of five feet on Earth. A stone could be thrown 600 feet on the Moon as easily as one could be thrown 100 feet on Earth.

All this seems fascinating, but we are not out of our ship yet. To get out, we would have to go through a double door. There would be one airtight door on the inside, and one on the outside. Between them there would be an air-tight compartment with air-pumps. We would first enter the compartment, close the inner door, and then start the pumps, pumping the air out of the compartment back into the main part of the ship. (Coming in, we would enter the compartment, close the outer door, and then slowly let the air back in. We could then open the inner door.)

This device for travelling between two different "atmospheres" is known as an "air lock", by comparison with a "water lock", which lifts ships from one body of water to another.

Of course we could not live for an instant in a vacuum. We would have to have special rubber and lead suits which would be airtight, and which would completely cover the body. There would be air inside the suits, and a fresh supply of oxygen would be fed in from a metal can of liquid oxygen at the back. The exhaled carbon dioxide would be discharged through a valve in the helmet. The suits would be coated with lead as a protection from harmful rays, for the Moon has no atmosphere, as the Earth has, to filter them out. We would need cooling devices for explorations during the daytime, for the temperature exceeds that of boiling water, but for nighttime explorations, we would need heating devices, for the temperature goes far below zero.

We need not expect to find life of any type on the Moon, not even one-celled organisms, for there is only the tiniest amount of air, or probably none at all (if there is any, it is composed of carbon dioxide, which cannot support life by itself, and is only 1/1,000,000 as dense as the Earth's air), no water, and no soil. Areas were once observed which grew darker as the Sun illuminated them more, and they were thought to be caused by lichens growing on the rocks, starting their growth when warmed by the Sun. However, today we have more powerful telescopes than the older astronomers, and can tell that these were optical illusions.

Some modern authorities are still reluctant to question the findings of these older astronomers. In fact, the darkening phenomenon has been reported even in very recent years. It is classified now as "unexplained." Optical illusions, shadows, lichen growths, or some change in the rocks? It will present another problem for the Lunar explorers to investigate and solve.

During the Lunar daytime, the Sun beats down unmercifully, raising the temperature of the rocks to 261 degrees Fahrenheit. Because the moon rotates so much

slower than the Earth, the day lasts for 15 of our days, and the night is of equal length. For fifteen days the Sun is withdrawn from the Moon's surface, and the rocks reach - 140 degrees F.

During the day the sky is inky black, for there is no atmosphere to reflect the Sun's rays. Stars are seen in the daytime as well as at night, and much better than from the Earth.

(Continued Next Issue)

DR. HARRISON S. BROWN

Dr. Harrison S. Brown, professor of geochemistry in the California Institute of Technology, received the $1,000 American Chemical Society Award in Pure Chemistry on March 24, this was announced by Dr. Edgar C. Britton of Midland, Mich., president of the Society. The presentation took place at the Buffalo, N. Y., session of the Society's 121st national meeting, Dr. Britton said.

Valuable contributions to the development of the atomic bomb have been credited to Professor Brown, who, during World War II, was research associate for the University of Chicago plutonium project and assistant director of chemistry at the Clinton Laboratories, Oak Ridge, Tenn., where his work greatly aided the development of the plutonium process for the Hanford, Wash., atomic project.

The social problems created by the development of the bomb have deeply concerned Professor Brown. As author of "Must Destruction Be Our Destiny," published in 1946, and co-author of "Years of the Moderns," published in 1949, he has become a well-known authority in this field. Since 1947 he has been executive vice-chairman and trustee of the Emergency Committee of the Atomic Scientists.

Professor Brown's peacetime scientific interests have dealt mainly with problems of the chemical composition of the universe. Employing chemistry, astronomy and geology in his research, he has studied the relationship of meteorites to the earth, other planets and the sun. His research has indicated that the planets of our solar system were formed by a condensation process from materials chemically similar to the sun and other stars, and that a single "cosmic catastrophe," millions of years ago, accounts for all the meteorites which have struck the earth.

The award, one of the highest honors in American chemistry, was presented to Professor Brown at the Society's general meeting by Dr. Britton, who is director of the Dow Chemical Company's organic research laboratory. Consisting of $1,000 and a diploma, the prize is presented annually to recognize and encourage fundamental research carried out in North America by young men and women. It is financed by the professional chemical fraternity Alpha Chi Sigma.

In 1947 Professor Brown won the $1,000 American Association for the Advancement of Science prize for his work on meteorites.

Born in Sheridan, Wyo., in 1917, Professor Brown was graduated from the University of California in 1938. He received the Ph. D. degree in chemistry from Johns Hopkins University in 1941, remaining there for a year as an instructor before joining the atomic project.

In 1946, after completing his wartime work, he became an assistant professor at the Institute for Nuclear Studies and the department of chemistry in the University of Chicago. He was promoted to associate professor there in 1948. He joined the faculty of the division of geological sciences at the California Institute of Technology in December, 1951.

At present Professor Brown is editing the "International Compilation of Meteorites and Their Properties," to be published in 1953. He is also the author of about 30 scientific papers in the fields of mass spectroscopy, thermal diffusion, fluorine and petroleum chemistry, meteorites, geochemistry, and planet structure.

He is a member of the American Chemical Society, the American Physical Society, the American Meteoritical Society, the American Astronomical Society, the American Association for the Advancement of Science, Sigma Xi and Phi Beta Kappa.

AMERICAN CHEMICAL SOCIETY
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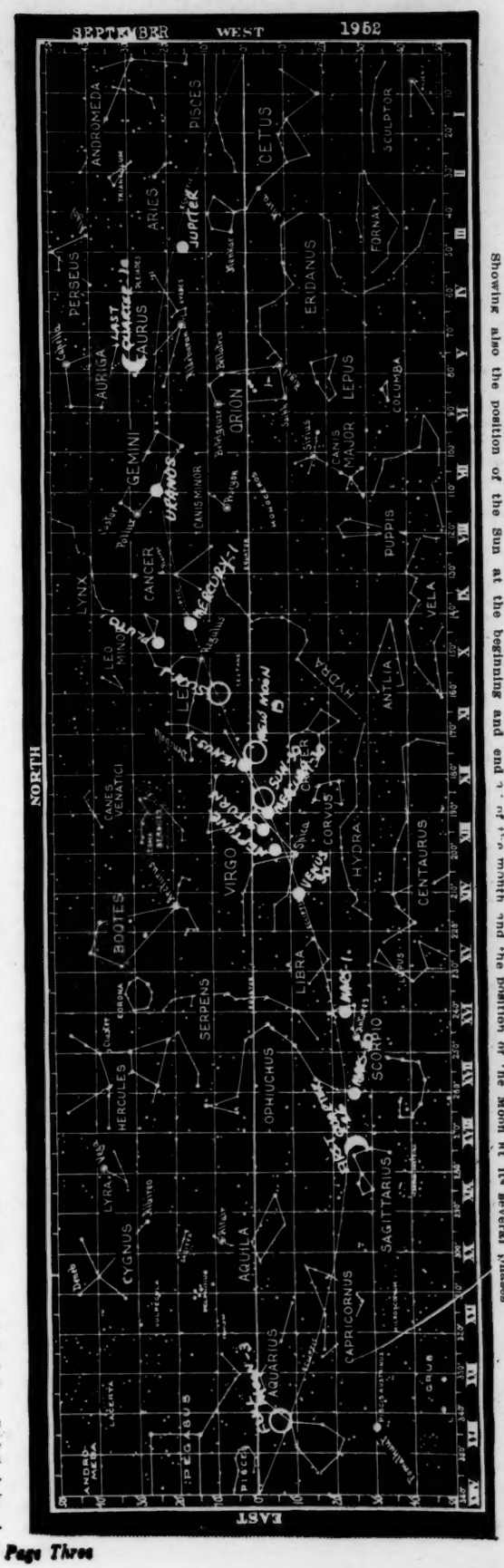

A MERCATOR PROJECTION OF THE STAR FIELD FOR 50 DEGREES NORTH AND 65 SOUTH OF THE EQUATOR

The Star Field makes an apparent complete revolution westward every 24 hours, hence the hourly division from I to XXIV, but this has no relation to the time that any portion of the map is in view Practical as a Star, Constellation and Planet Finder for the current month (July-Aug.-Sept.—Anywhere in the world. Showing also the position of the Sun at the beginning and end of the month and the position of the Moon at its several phases

XUM

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AMATEUR'S FORUM

By IRVING L. MEYER, M. S.

July 1952

THE SUN: is now moving at increasing speed toward the southern hemisphere, and travels from Gemini into Cancer. It is farthest from the earth the 2nd at 94.6 million miles.

THE MOON: is closest to the earth (at perigee) the 8th at a distance of 223,000 miles, and is farthest (at apogee) the 23rd at 252,000 miles.

The Moon's Phases (E. S. T.):

Last Quarter		13 at 10:42 PM
Full Moon	July	7 at 7:33 AM
New Moon		21 at 6:30 PM
First Quarter		29 at 8:51 PM

MERCURY: is in the evening sky, moving from Cancer into Leo, and reaches greatest elongation east of the Sun, 26° 40', on the 15th. For a few days before and after that date Mercury will be visible shortly after sunset, as a bright star close to the western horizon. Magnitude is 0.6. In the telescope, moderate power will reveal its 8" - diameter disc to look like the half moon, somewhat less million miles, and the 31st is 91 million miles.

VENUS: is in the evening sky, but too close to the Sun for worthwhile observation. A keen-eyed observer might pick up the planet in the bright twilight, close to the horizon after sunset. It moves from Gemini through Cancer, into Leo, and distance decreases from 161 to 158 million miles.

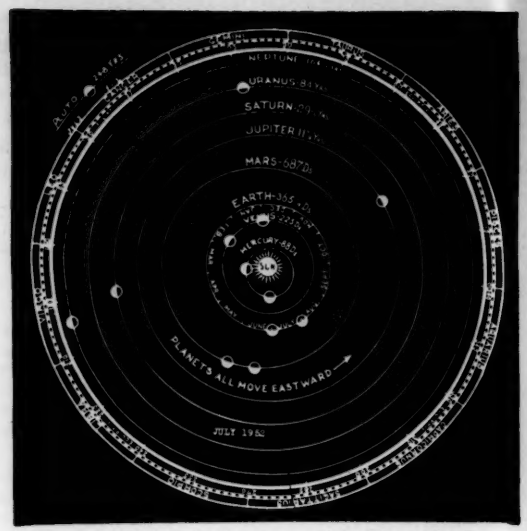
MARS: is now receding from the earth, but it is still a bright object in the evening sky. This ruddy planet moves from Virgo into Libra, and geocentric distance increases from 70 to 80 million miles. Apparent diameter decreases at the same time from 12½" to 10", and magnitude from -0.5 to 0.0. It is still an interesting object in the telescope, but fairly high power is called for to resolve the surface features. Mars sets around midnight.

JUPITER: in Aries, can be observed satisfactorily in the late morning sky. It is 491 million miles away the 15th, with magnitude -1.9, apparent equatorial diameter 37¼", and polar diameter 2½" less. This flattening at the poles is readily noticeable in small telescopes, as are the cloud belts across the disc. The four bright satellites can be seen in opera glasses.

SATURN: in the evening sky, sets early in the evening from a position in Virgo. While still observable, this 1st magnitude giant is no longer well placed. It will soon leave the evening sky. Distance the 15th is 912 million miles.

URANUS: is in conjunction with the Sun the 6th, in Gemini, and enters the morning sky. Too close to the Sun all month to be observable. Maximum geocentric distance, the 15th, is 1840 million miles.

NEPTUNE: near Saturn in Virgo, is also in the evening sky, and, too, sets well before midnight. Of the 8th magnitude, it cannot be seen with the unaided eye. Distance the 15th is 2819 million miles.



Orbits and Heliocentric Movements of the Planets for July

NOTE: The planets are shown in their respective orbits. Two positions, one for the first, and one for the last day of the month, are given for Mercury, Venus and Mars. The arrow indicates the last day of the month. Jupiter, Saturn, Uranus and Neptune are shown in the mean position for the current month.

AMATEUR'S FORUM

By IRVING L. MEYER, M. S.

August 1952

THE SUN: leaves Cancer, traveling into Leo. Distance decreases from 94.3 to 93.8 million miles.

THE MOON: is at perigee the 5th at 222,000 miles, and is at apogee the 19th at 253,000 miles.

The Moon's Phases (E. S. T.):

Full Moon	August	5 at 2:40 PM
Last Quarter		12 at 8:27 AM
New Moon		20 at 10:20 AM
First Quarter		28 at 7:03 AM

There will be a partial eclipse of the Moon, magnitude .538 (where the Moon's diameter is 1.0). It will not be visible in the Western Hemisphere except for a small section of eastern South America.

Circumstances of the Eclipse (E. S. T.):

Moon enters penumbra	August	5 at 12:27 PM
Moon enters umbra		5 at 1:33 PM
Middle of eclipse		5 at 2:47 PM
Moon leaves umbra		5 at 4:01 PM
Moon leaves penumbra		5 at 5:08 PM

MERCURY: moves about in a small area of western Leo. It is in interior conjunction with the Sun on the 12th, thereafter appearing in the morning sky, and toward the end of the month will be visible in the dawn-lighted sky, low in the east. Greatest elongation west of the Sun 18° 11', occurs the 29th, on which date magnitude is 0.1, the planet is about 40% illuminated, and apparent diameter is 7". Even a relatively small telescope will show Mercury to be a crescent. Minimum geocentric distance, the 9th, is 56 million miles.

VENUS: travels from the Cancer-Leo border into Virgo. It now sets about an hour after the Sun, and can be seen as a brilliant star in the evening twilight. Distance the 1st is 157 million miles, and the 31st is 149 million miles.

MARS: moves from Libra into Scorpio, in the evening sky. Though still a bright planet, it is now racing eastward to escape the Sun. It sets before midnight. It increases in distance from 86 million miles to 103 million miles, with consequent decrease in brightness from magnitude 0.0 to 0.4, and in diameter from 10" to 8".

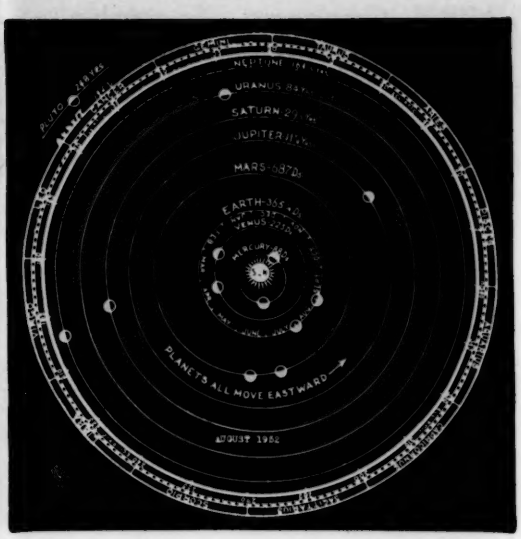
JUPITER: rises about midnight from a point in Aries. As a morning sky object it is now well placed for observation. On the 15th we find distance 448 million miles, with equatorial diameter 41" and magnitude-2.0. It is a very interesting telescopic object and well within the grasp of small instruments.

SATURN: plods eastward in Virgo in the evening sky. No longer well placed for observation, it sets early in the evening Distance the 15th is 954 million miles.

URANUS; is in Gemini in the mornig sky. A 6th magnitude object, it is too close to the Sun for satisfastory observation Distance the 15th is 1820 million miles.

NEPTUNE: is in the evening sky pretty close to Saturn, in Virgo. It is leaving the evening sky, and is not well placed for observation. Distance the 15th is 2865 million miles.

IN SELECTING YOUR GIFTS, INCLUDE A SUBSCRIPTION TO THE "MONTHLY EVENING SKY MAP" FOR YOUR FRIENDS. IT WILL BRING THEM A YEAR OF INTELLECTUAL PLEASURE, AND LAY THE FOUNDATION OF A LIFETIME OF INTELLIGENT OBSERVATION OF THE HEAVES IN YOUNG PEOPLE.



Orbits and Heliocentric Movements of the Planets for August

PLANETARY CONFIGURATIONS

Eastern Standard Time

July 1952

July 1 — 8:31 AM Conjunction Neptune and Moon; Neptune north 6° 36'
July 2 — 10:32 AM Conjunction, Mars and Moon; Mars north 3° 43'
July 2 — 9:00 PM Earth in aphelion.
July 3 — 10:00 AM Conjunction, Venus and Uranus; Venus north 0° 21'
July 6 — 4:00 AM Conjunction, Uranus and Sun
July 11 — 4:00 AM Quadrature, Neptune and Sun
July 12 — 8:00 AM Mercury in descending node
July 15 — 4:00 PM Mercury greatest elongation east, 26° 40'
July 15 — 11:19 PM Conjunction, Jupiter and Moon; Jupiter south 6° 36'
July 18 — 12:00 AM Venus in perihelion
July 20 — 1:33 PM Conjunction, Uranus and Moon; Uranus south 2° 47'
July 22 — 11:26 AM Conjunction, Venus and Moon; Venus south 0° 2'
July 22 — 2:00 PM Mercury in aphelion
July 23 — 11:28 PM Conjunction, Mercury and Moon; Mercury south 2° 12'
July 27 — 11:03 PM Conjunction, Saturn and Moon; Saturn north 7° 3'
July 28 — 4:18 PM Conjunction, Neptune and Moon; Neptune north 6° 44'
July 28 — 6:00 PM Mercury stationary in Right Ascension
July 30 — 1:32 PM Conjunction, Mars and Moon; Mars north 3° 34'

PLANETARY CONFIGURATIONS

Eastern Standard Time

August 1952

August 4 — 1:00 PM Conjunction, Mercury and Venus; Mercury south 6° 24'
August 5 — Partial eclipse of the Moon.
August 8 — 4:00 PM Venus greatest heliocentric latitude north
August 11 — 10:00 PM Mercury greatest heliocentric latitude south
August 11 — 7:00 AM Quadrature, Jupiter and Sun
August 12 — 11:44 AM Conjunction, Jupiter and Moon; Jupiter south 6° 43'
August 12 — 1:00 PM Inferior conjunction, Mercury and Sun; Mercury south 4° 41'
August 13 — 8:00 PM Conjunction, Pluto and Sun
August 16 — 4:00 AM Quadrature, Mars and Sun
August 16 — 10:29 PM Conjunction, Uranus and Moon; Uranus south 2° 42'
August 19 — 7:25 AM Conjunction, Mercury and Moon; Mercury south 4° 11'
August 20 — Annular eclipse of the Sun
August 21 — 7:00 PM Mercury stationary in Right Ascension
August 22 — 12:58 AM Conjunction, Venus and Moon; Venus north 3° 57'
August 24 — 9:38 AM Conjunction, Saturn and Moon; Saturn north 7° 7'
August 24 — 11:21 PM Conjunction, Neptune and Moon; Neptune north 6° 44'
August 27 — 11:35 PM Conjunction, Mars and Moon; Mars north 3° 16'
August 29 — 11:00 PM Mercury greatest elongation west, 18° 11'
August 30 — 11:00 PM Mercury in ascending node

SOUTHERN HEMISPHERE

From pole to pole science has divided the earth in 24 patches, or hour-strips. Every hour one of these patches has high noon, while the opposite one has midnight. Twelve are in daylight, twelve in darkness at the same time. At the Equator these patches are all 1,000 miles wide, at the poles they run to a point. The lines that divide them are called meridians of longitude or hour-circles. The first meridian runs through the city of Greenwich, England. On the twelfth meridian (180 degrees) which runs through the Pacific Ocean near the Fiji islands a day of the calendar is skipped to give the whole world the same date. Parallel with the equator, laterals divide the earth in degrees and latitude north and south. Any spot on land or sea can be located in this way by its degree of longitude and N. or S. latitude.

The heavens are divided in the same way. Longitude is called right ascension and is figured in hours, minutes and seconds. The zero meridian starts at the vernal equinox, a line from the center of the earth through the center of the sun on March 21. Right ascension continues eastward through the equator. The heavenly equator represents the earthly 360 degrees. As it takes the earth one hour to pass under 15 degrees of the starry sphere, one hour right ascension is equal to 15 degrees.

Terrestrial latitude corresponds with celestial declination, and is figured from one to 90 degrees north or south from the equator. The heavenly equator represents the earthly equator projected into space.

The U. S. Naval Observatory publishes the Ephemeris and Nautical Almanac, which gives the positions of the principal heavenly bodies for every day in the year This useful book is a valuable aid to navigators and can be bought for $2.50 from the U. S. Government Printing Office, Washington, D. C

TO CONVERT DEGREES INTO TIME

Rule 1—Divide the degrees by 15, for hours; and multiply the remainder, if any, by 4, for minutes.

2. Divide the odd minutes and seconds in the same manner by 4, for the next lower denomination.

Example 1.—Convert 32° 34' 45" into time.

Thus,	32°÷15=2h.	8'	
	34 ÷15=	2	16"
	45 ÷15=		3
Ans.	32° 34' 45"=2h.	10'	19"

Example 2.—If it is 12 o'clock at this place, what is the time 20° east of us?

Thus fifteen in 20°, once, and five over; the once is 1 hour, and the 5 multiplied by 4, gives 20 minutes; the time is then 1 hour and 20 minutes past 12.

Example 3.—The longitude of Hartford is 72° 50' west of Greenwich; what time is it at Greenwich when it is 12 o'clock at Hartford? Ans. 4h. 51m. 20s.

Example 4.—When it is 12 o'clock at Greenwich, what is the time at Hartford? Ans. 7h. 8m. 40s.

TO CONVERT TIME INTO DEGREES

Rule—Multiply the hours by 15, and to the product add one-fourth of the minutes, seconds, etc., observing that every minute of time makes ¼°, and every second of time ¼'.

Example 1.—In 2 hours, 10 minutes, and 19 seconds; how many degrees?

Thus;	2h.	10m.	19.
	15		
	30°		
Add 10 quarters, or ¼ of the min.	2	30'	
Add 19 quarters, or ¼ of the sec.		4	45"
Ans.	32°	34'	45"

Ex. 2.—When it is 12 o'clock at Hartford, it is 4 hours, 51 minutes, and 20 seconds past noon at Greenwich; how many degrees is Hartford west of Greenwich?

Thus: 15 times 4 is 60—added to ¼ of 51, is 72° 45", and this increased by ¼ of 20, is 72° 50'. Ans.

MOUNT STROMLO OBSERVATORY, Canberra, Australia

The Commonwealth Observatory and administrative buildings.

American and Australian-made machines stand side by side in the workshop. The machine in the foreground is actually a composite — it has an Australian base and an American head. Mount Stromlo workshops, with the exception of those at Mount Wilson Observatory, California, are comparable with the best in the world.

AUSTRALIA TO MAP SOUTHERN HEAVENS

By P. Knox

The work of mapping the Southern Hemisphere heavens will shortly begin at Australia's Mt. Stromlo Observatory near Canberra, the national capital.

The task will be carried out by one of the most cosmopolitan groups of scientists in the world, who have chosen Mt. Stromlo as an outstanding point of observation for Southern skies. They will be under the charge of the Observatory Director, Professor R.V.D.R. Woolley.

Mt. Stromlo Observatory, which financed and conducted by the Australian Department of the Interior, stands on a

hill 2,6000 feet up in the Southern highlands in the Australian Capital Territory. It is world-renowned for its astronomically near-perfect atmosphere and sky.

Work on a Northern Hemisphere map is already under way at Mt. Palomar Observatory in Southern California. It is expected to be completed within three years. When the work to be done at Mt. Stromlo is added, astronomers expect to have the best map yet produced.

All told, they expect to map about 1,000 million stars. The human eye can perceive about 3,000 stars at any one time.

Scientists think that this photographic study of the skies will tell us with much more certainty just what is going on in the Universe.

Among the scientists at Mt. Stromlo is a Frenchman, Dr. Gerard de Vaucouleurs, who is working as a Research Fellow of the Australian National University. Dr. de Voucouleurs is one of a number of astronomers to whom the University has granted research fellowships.

These fellowships enable recipients to work in Australia for varying periods - in Dr. de Vaucouleur's case 3 years - under the auspices of the National University. Working with him are English, German, Russian, Polish, New Zealand and Australian scientists. They will shortly be joined by a party of United States astronomers who have been in South Africa, and who will work in the Yale and Columbia Universities' Southern Hemisphere Observatory being established at Mt. Stromlo. A Swedish team from Upsala University is also expected in Australia late this year.

New equipment, designed to make Mt. Stromlo one of the world's best observatoriés, is also on its way. When the American and Swedish contributions arrive, it is expected that Mt. Stromlo will house equipment worth approximately £2,000,000.

According to Dr. de Vaucouleurs, the proposed photographic study will reveal stars "millions of times fainter than the faintest stars visible to the naked eye". It will be especially valuable in the case of the Southern Hemisphere, which has long remained comparatively little known.

In addition to photographing the stars, the astronomers will also seek to discover the velocities of stars the existence of which is unknown to the layman.

Dr. de Vaucouleurs has investigated for some years the activities of the planet Mars. Interest in the solar system's "puzzle planet" is rapidly approaching a peak amongst amateur and professional astronomers. On April 9 this year (1952), Earth and Mars will pass astronomically close to one another as they progress in their orbits around the sun. They will approach each other again in 1954 and in 1956 - in the latter year, the unusually small distance of only 36,000,000 miles will separate them. Mars will at these times be more easily observable in the Southern Hemisphere and Australian astronomers are preparing for the close-up.

Dr. de Vaucouleurs thinks that, if any planet has life, Mars is the one. It has, in common with the earth, snow deserts, sand storms, cloud formations, atmosphere and possibly some vegetation. Unusual shapes sometimes appear and then fade, and puzzling "canals" and "rivers" have intrigued scientists for many years. Some of these questions may be solved this year.

Mt. Stromlo Observatory will probably devote little time to Mars, as it is far more interested in preparing for the gigantic photographic exploit which is being given first preference in Australia as in most other world observatories devoted to astronomical geography.

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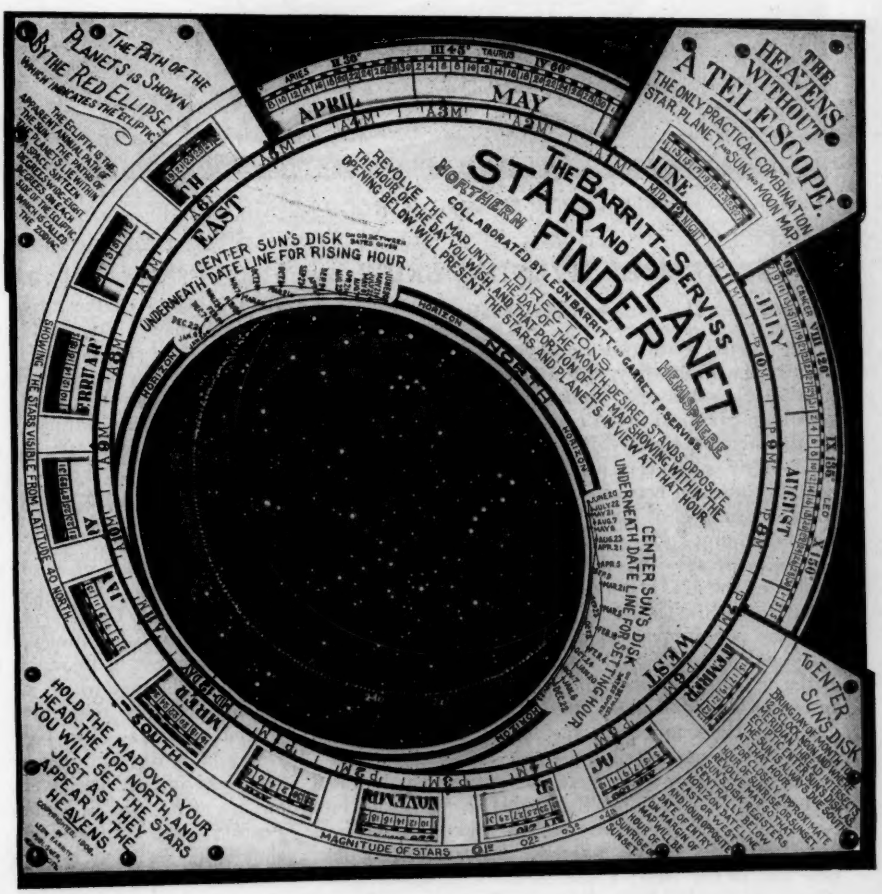
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HOLD THE MAP OVER YOUR HEAD-THE TOP NORTH, AND YOU WILL SEE THE STARS JUST AS THEY APPEAR IN THE HEAVENS.
TO ENTER SUN'S DISK
MAGNITUDE OF STARS

EVENING SKY MAP FOR AUGUST

AT 9:00 P.M., AUG. 1: 8:00 P.M., AUG. 15: 7:00 P.M., AUG. 31:

SEPTEMBER EVENING SKIES

The Stars and Constellations

One of the glories of the September sky is the vast arch of the *Milky Way*, spanning the heavens from the northeast to southwest. Some of its richest portions are seen high overhead in the constellation *Cygnus*, marked by the striking figure of the "Northern Cross." The *Milky Way* is also very bright where it dips toward the southern horizon between *Scorpio* and *Sagittarius*. In the northern part of the sky it appears most brilliant in *Cassiopia* and *Perseus*. There is no greater pleasure for the possessor of a small telescope than to follow the course of the *Milky Way* throughout its whole visible extent, using the lowest magnifying powers with which the glass is equipped. A power of 25 diameters on a three-inch telescope will reveal clouds upon clouds of glittering stars so small and so innumerable that they resemble diamond dust strewn upon a black background. Here and there the *Milky Way* gathers in knots and spirals which are wonderful to look upon.

The *Milky Way* may serve us on this occasion as a sort of highway dividing the visible constellations into two great fields. Five stars usually ranked as the first magnitude are visible, namely, *Arcturus*, in *Bootes*, now low in the west; *Vega*, in *Lyra*, high overhead; *Altair*, in *Aquila*; *Formalhaut*, in *Picses Australis* and *Capella*, in *Auriga*, which is just rising far round in the northeast. Of these five, three are in reality much brighter than a standard first magnitude star; they are *Capella*, *Vega* and *Arcturus*. Every one of them is not only a very bright object in the sky, but also a much larger sun than ours, exceeding it, perhaps, not less than a thousand times in light-giving power. Each may be the center of a vast system of planets. But *Capella* is double, composed of two enormous suns close together, a fact which introduces many complications from the point of view of an attendant planetary system.

The readers will observe that the "*Great Dipper*" in *Ursa Major*, has now descended below the pole in the northwest while *Cassiopeia*, opposite to it, has attained a comparatively great elevation in the northeast. It is always interesting to watch the "balancing" of these two constellations, which seem to play at see-saw, with the *Pole Star* for their pivot.

Andromeda is now becoming conspicuous in the west and northwest. The reader will observe that the star *Alpheratz*, at the northeast corner of the Great Square of *Pegasus*, is common to the two constellations *Pegasus* and *Andromeda*. In reality, however, it should be assigned to *Andromeda* alone, and it is counted for *Pegasus* simply because it serves to complete the figure of the "Square." *Alpheratz* is repre-

PLANETARY CONFIGURATIONS

Eastern Standard Time

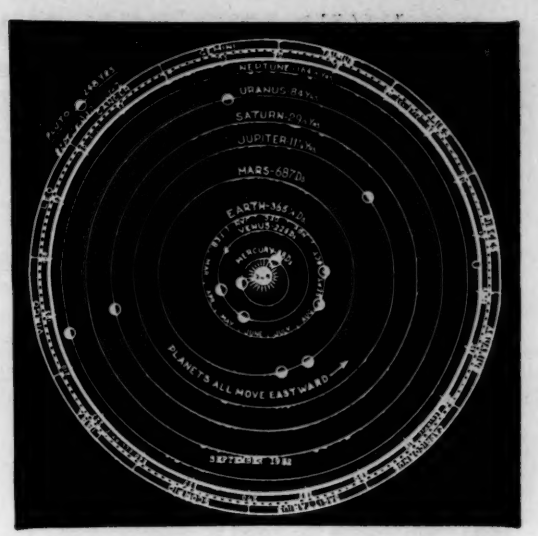
September 1952

Sept. 4 —	2:00 PM	Mercury in perihelion
Sept. 8 —	9:51 PM	Conjunction, Jupiter and Moon; Jupiter south 6° 44'
Sept. 9 —	8:00 PM	Jupiter stationary in Right Ascension
Sept. 13 —	7:13 AM	Conjunction, Uranus and Moon; Uranus south 2° 33'
Sept. 14 —	8:00 PM	Mercury greatest heliocentric latitude north
Sept. 15 —	6:00 PM	Conjunction, Venus and Saturn; Venus south 1° 37'
Sept. 18 —	8:15 PM	Conjunction, Mercury and Moon; Mercury north 4° 54'
Sept. 20 —	4:00 AM	Conjunction, Venus and Neptune; Venus south 1° 6'
Sept. 20 —	9:15 PM	Conjunction, Saturn and Moon; Saturn north 7° 9'
Sept. 21 —	6:34 AM	Conjunction, Neptune and Moon; Neptune north 6° 41'
Sept. 21 —	9:18 AM	Conjunction, Venus and Moon; Venus north 5° 35'
Sept. 22 —	9:24 PM	Sun enters Libra; Equinox
Sept. 24 —	9:00 AM	Superior conjunction, Mercury and Sun; Mercury north 1° 25'
Sept. 25 —	1:22 PM	Conjunction, Mars and Moon; Mars north 2° 35' Mercury south 4° 41'

sented in the old constellation figures, such as those drawn by the celebrated German artist, Albrecht Durer, for Flamsteed's "Celestial Atlas," as shining in the forehead of *Andromeda*. It is a star of the second magnitude. Two other stars of the same magnitude form a line with it, stretching downward toward the horizon, the first of these in *Andromeda's* girdle and the second in her foot.

Between *Andromeda* and the Pole is *Cassiopeia*, and below her feet in the northeast appears *Perseus*. The story of these constellations is one of the most interesting instances of the connection between ancient mythology and the imaginary figures in the starry heavens. *Andromeda* represents the beautiful daughter of *Cassiopeia*, queen of Ethiopia, who was chained to a rock by the seaside to be devoured by a sea monster as a punishment for her mother *Cassiopeia*, who had boasted herself as fairer than the sea nymphs. According to the fable she was rescued by the hero *Perseus* who froze the sea monster into stone by presenting before its eyes the head of the snake tressed *Gorgon*, which he had cut off. A curious fact in connection with this legend is that attached, as it were, to the constellation *Perseus* is a small group of stars comprising one of the most wonderful objects in the heavens. *Algol*, this star, whose position is clearly indicated on the chart, varies, in a period less than three days, to such a degree that it is at certain periods several times brighter than at others. The changes take place in regular order, giving to the star the look, as has been somewhat fancifully said, of a "a slowly winking eye." The word 'Algol' in Arabic means "The Demon" and it is at least a curious coincidence that so strange an object should be attached to the constellation *Perseus*, when we recall the story of that constellation, as just given.

The sun enters the Zodiacal sign Libra, and the astronomical Autumn begins at 10:45 o'clock on the morning of the 23rd. This is called the Autumnal equinox, and the position of the Sun at this epoch is indicated on the chart by the crossing of the lines of the equator and the ecliptic at the figures 180. The ecliptic being the apparent path of the Sun through the heavens, the reader will notice that after passing the Autumnal equinox his course will lie constantly below or south of the equator, until he returns into the northern hemisphere after six months at the crossing point on the opposite side of the chart known as the vernal equinox.



Orbits and Heliocentric Movements of the Planets for Sept.

AMATEUR'S FORUM

By IRVING L. MEYER, M. S.

September 1952

THE SUN: crosses the equator into the southern hemisphere on te 22nhd. It moves from Leo into Virgo, at geocentric distance decreasing from 93.7 to 93.0 million miles.

THE MOON: is closest to the earth the 3rd at 223,000 miles distance, and is farthest the 15th at 252,000 miles distance.

Full Moon	September	3 at 10:19 PM
First Quarter		26 at 3:31 PM
Last Quarter		10 at 9:36 PM
New Moon		19 at 2:22 AM

MERCURY: moves through Leo into Virgo. For the first few days of the month it is close to greatest elongation west of the Sun, and consequently will be observable close to the eastern horizon just before sunrise. The rest of the month it will be too close to the Sun to be observable, as superior conjunction with the Sun occurs the 24th, and Mercury will enter the evening sky. Geocentric distance is 90 million miles the 1st, and 131 million miles the 30th.

VENUS: is in Virgo all month, in the evening sky. Though still pretty close to the Sun, its intense brilliance (magnitude -3.3) makes this planet readily visible in the evening, immediately after sunset. Distance decreases from 149 million miles the 1st to 137 million miles the 30th.

MARS: moves from Scorpio into the southern tip of Ophiuchus. It can still be observed in the early evening, though increasing distance is reducing brightness and size rapidly. Distance the 1st is 103 million miles and the 30th is 118 million miles.

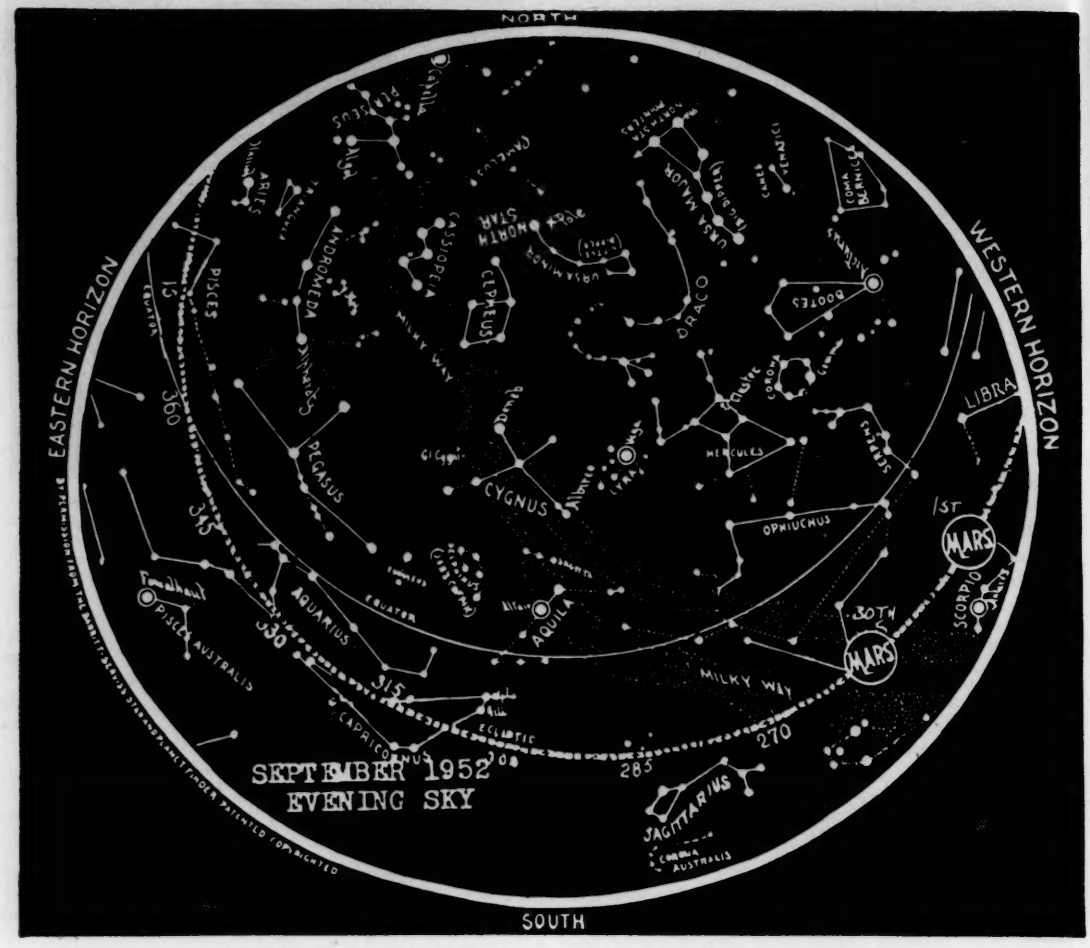
JUPITER: rises shortly after sunset from a point close to the Aries-Taurus boundary. It is approaching opposition, and is well placed for observation. Opera glasses will reveal the four bright moons and the disc; a telescope will show the cloud bands across the disc, as well as the polar flattening. On the 15th, distance is 407 million miles; magnitude is -2.3; and equatorial diameter is 45".

SATURN: is in the evening sky all month, but too close to the Sun for satisfactory observation. In Virgo, it will be in conjunction with Venus on the 15th, being 1° 37' north of that planet. Distance the 15th is 982 million miles.

URANUS: remains in Gemini, and is pretty easily observable in the late morning sky. Magnitude of 6 puts it at the limit of naked-eye visibility, but it is readily perceived in opera glasses. Distance the 15th is 1783 million miles.

NEPTUNE: is in Virgo all month, but too close to the Sun to be observable. It is in conjunction with Venus on the 20th, with Venus south of Neptune 1° 6'. Distance the 15th is 2897 million miles.

EVENING SKY MAP FOR SEPTEMBER



AT 9:00 P.M., SEPT. 1; 8:00 P.M., SEPT. 15; 7:00 P.M., SEPT. 30;

This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitude in Europe.

QUESTIONS AND ANSWERS

William Bentley writes: "Will you please explain what is meant by fixed stars? Are they suns? Are they stationary or do they move around some center; if so, in what sense are they fixed?"

ANSWER:

The "fixed" stars are the celestial bodies which are outside of the solar system and whose positions relative to one another show no change to the unaided eye during periods of observation extending even over centuries. This name excludes, of course, the sun, moon, the planets, as Saturn, Jupiter, Earth, etc., and comets. The fixed stars are suns inasmuch as they are glowing bodies in space which send out light and heat. When their positions are carefully determined with the most delicate instruments of precision it is found that they show motions which are in themselves very rapid, but which appear so minute to us simply because of the enormous distance which separates the stars and the earth. They certainly are all in motion in space about the common center of gravity of all the stars, and the term fixed is used simply to distinguish them from the bodies of the solar system whose motions are really apparent to the naked eye. The ancients first applied this term and it has persisted because of its great convenience.

Albert Jennings writes: "What is the generally accepted explanation of the so-called 'Dark Days'? I refer to the class of dark days of which May 1780, was a notable example."

ANSWER:

"A dark day" is one on which the sun's light is dimmed by atmospheric conditions and it is not due to any change in the sun itself. On the date mentioned by you a particularly large and heavy cloud shut off the sunlight and darkened the entire area of New England. Another "dark day" occurred in August, 1880.

THE CONSTELLATIONS IN AUGUST

Auriga is still near the North, the bright star Capella will be seen scintillating above the horizon. Perseus has risen a little higher in the sky, and is now nearly North-East; while above it is Cassiopeia and Cephus. To the left of Cephus is Ursa Minor, which is still above the Pole Star, but it has now fallen towards the left.

Andromeda lies horizontal between the North-East and the East; while below it will be seen triangulum. Pegasus is to the right of Andromeda; it is now due East and completely above the horizon; it will be noticed that the Great Square is tilted up, the diagonal formed by the stars Algenib and Scheat is nearly vertical.

Pisces is beginning to appear again, part of it being above the horizon and directly underneath Pegasus. To the right of Aquarius, and a little beyond the South-East, will be seen

another Zodiacal constellation—Capricornus, the goat. Above Capricornus is Aquila, with its leading brilliant Altair; to the left of which will be seen Delphinus, and above the Dolphin is the conspicuous Cross of Cygnus—Arided (a) being at the top, and Albireo (b) at the bottom. To the right of the Swan is Lyra; the bright Vega is now due South and high up in the heavens overhead; observe the conspicuous triangle formed by the stars Vega, Altair, and Arided.

In the South we see Sagittarius, part of it only being above the horizon; to the right of which is Serpens; while above the Serpent is the Northern Crown. Hercules is above the Serpent-bearer, and above Hercules is the head of Draco, now exactly overhead; the tail of the Dragon will be observed twisting down towards the North.

Virgo will be seen setting in the West, the brilliant star Spica is rapidly sinking below the horizon. Coma Berenices is in the West above Vindemiatrix (of Virgo); while to the left of Coma Berenices is Arcturus in Bootes. Part of Leo has now disappeared below the horizon, the remaining part of it which is visible will soon sink out of sight; above the star in the Lion will be seen Cor Caroli, to the right of which is the great Bear, now North-West and midway between the horizon and the zenith.

THE MILKY WAY

Because interest in "The Monthly Evening Sky Map" is no longer confined to the professional astronomer but includes among its subscribers a growing number of laymen, the few articles I am privileged to offer will be addressed to the latter especially.

Since the one-hundred-inch reflector was placed on Mt. Wilson, a vast amount of stellar information has been accumulated. But there was a time when it was believed that only a few thousand stars, among them our sun, composed the universe. It is now known however that the stellar population is far too vast ever to be counted; also that the stars are organized into millions of groups, each aggregation composed of a billion, or more, individual globes of incandescent gases. These groups are so far removed from each other—say a million light-years—and are so extensive they frequently are mentioned as "island universes".

The sun, with his satellites, is located in the disc-like formation known as the Milky Way galaxy, the apparent position being well toward the edge. The number of stars in our galaxy cannot be determined; however, the estimates vary from one thousand million to three times that number—the unaided eye sees not more than six thousand between sunset and sunrise; but the telescopic camera prints such a bewildering picture of the stellar host one regrets the limitation of human vision.

Simply as an object for admiration the Milky Way is supremely interesting; but viewed in the light of Science it is, to say the least, awe-inspiring. When you look at the "Pearly river of the sky" you see only a few near-by neighbors of our say, half a thousand light-years away—but beyond them lie the uncountable multitude of stars. It is only the combined glow of the nearer bodies that reaches our eyes—a glow that started earthward long before Columbus sailed an uncharted sea; long before the Roman Empire canme into existence; long, long before events of history were first recorded; for, covering eleven milllion miles of space every minute, the light has been fifteen thousand years on the flight from just the frontier suns, and back of them are others whose light-rays started our way fifty-thousand years ago—yes, even longer than that, for the Milky Way disc is supposed to be all of one-hundred thousand light-years in diameter and about ten or fifteen thousand in thickness.

It would be useless to state these incomprehensible distances did they not help us to grasp some idea of celestial depths. Even so, how many of human kind realize what just "one million" means. Earth itself has not turned on its axis a million times since Christ was born—several centuries yet must pass before such a goal is reached.

No one has ever seen the Milky Way in all its beauty unless it was viewed from the desert or from some mountain top when no moon was present to dim its lustre. There in the silence this ethereal formation, stretched irregularly across the heavens makes an indescribable appeal.

To the so-called savages of the western plains, long before the white-man's "civilizing influence" was felt, this glowing path was the trail over which the departed braves rode their phantom steeds to the Happy Hunting Grounds, and the brilliant stars adorning it were camp-fires that marked the end of each day's ride.

Bushmen of Australia and the wild tribes of Africa and other primitive peoples have all viewed the Milky Way as the Highway of the Dead. From the higher latitudes of the northern half of earth, only the less attractive sections of the Milky Way are in view; this far-reaching formation sheds upon Australia, South America and Africa a wealth of beauty more glorious than you and I are privileged to behold.

Dark spots and lanes are abundant throughout the galaxy, these are designated as "dark nebulae" in contra distinction to the luminous clouds of gaseous matter also plentiful therein.

Until recent years these dark areas were supposed to be holes opening into infinity, but now they are known to be wide-spread blankets of dustlike matter combined with Nebular gases, and sufficiently opaque to hide from our vision even the most brilliant celestial objects.

The dark wedge that separates the Milky Way into the two major branches, visible in northern skies, is of that type. It is believed that back of this obscuring veil an untold number of stars are hidden from human eyes.

The abundant nebulae, both the dark and those aglow with a wierd greenish light are interesting subjects for mental speculation. Did they come into being because of celestial catastrophies, and will they evolve, ages hence, into suns and worlds with their satellites? If such be the case we can gain therefrom a concept of the continuity of matter—that throughout the Cosmos nothing is ever annihilated, that change in form is all that takes place—that over and over and over again the endless cycle of Creation wheels its Majestic course.

PREFACE TO THE ORBS OF HEAVEN

This article and those which will follow written by an American Author, contains a graphic and popular exposition of the great discoveries of Astronomical Science; and originated, under the following circumstances.

The writer conceived the idea of erecting a great astronomical observatory in the city of Cincinnati. His attention had been for many years directed to this subject, by the duties of the professorship which he held in the College. "In attempting to communicate the great truths of Astronomy, there were no instruments at hand, to confirm and fix the facts recorded in the books."

Up to that period America, and the western portions particularly, had given but little attention to practical Astronomy. An isolated telescope was found here and there scattered through the country; but no regular organized observatory, with powerful instruments, existed within the limits of the United States, so far as the writer knew.

To ascertain whether any interest could be excited in the public mind, in favour of Astronomy, a series of lectures was delivered in the Hall of the Cincinnati College. Encouraged by the large audiences which continued through two months to fill the lecture-room, and still more by the request to repeat the last lecture of the course in one of the churches of the city, the Author matured a plan for the building of an observatory. In pursuance of that plan, and in consequence of the favour with which it was received, he visited Europe, procured instruments, examined observatories, and obtained the requisite knowledge to erect and conduct the institution which it was hoped would be one day reared.

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THE CONSTELLATIONS

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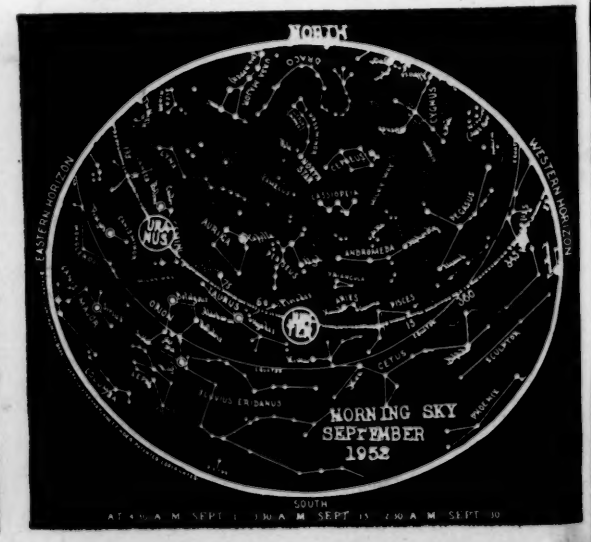
MORNING SKY MAP AUGUST 1952

MORNING SKY MAP SEPTEMBER 1952



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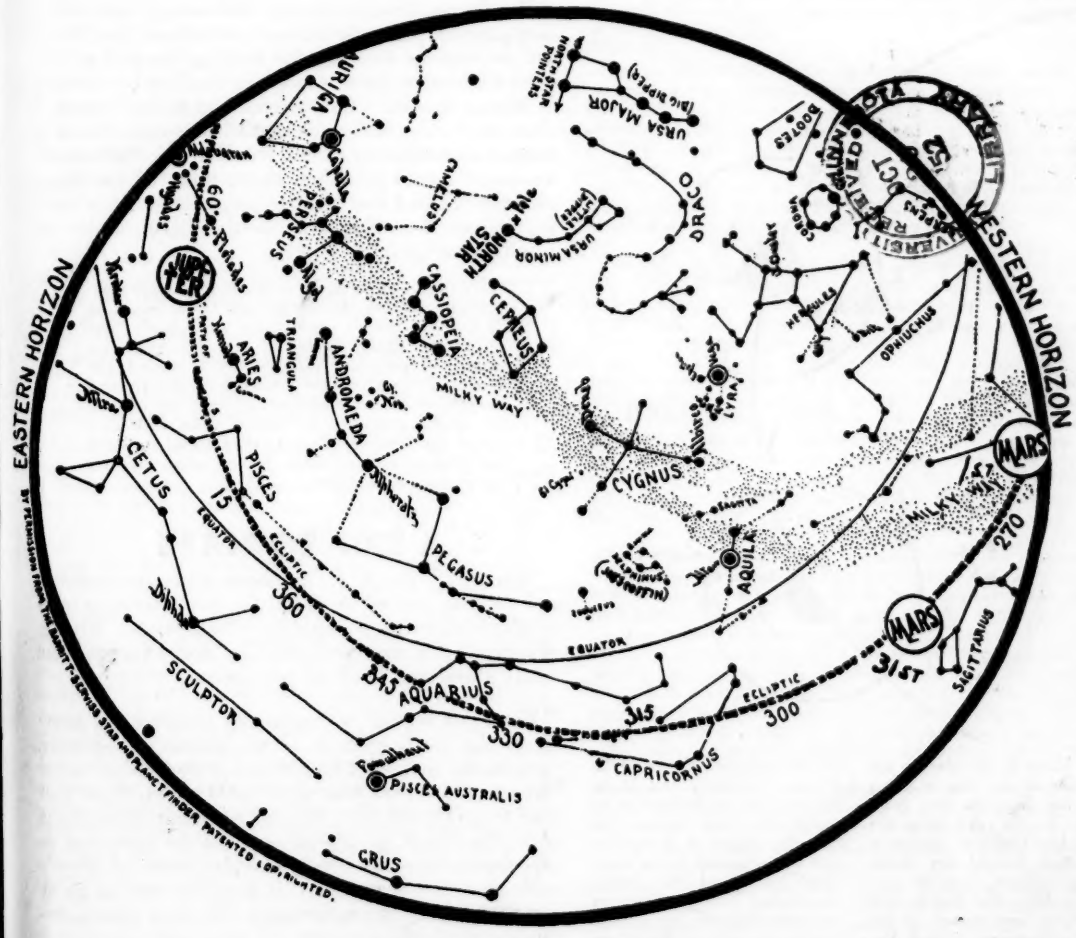
EVENING SKY MAP FOR OCTOBER



Face South And Hold The Map Overhead. The Top North And You Will See The Stars And Planets Just As They Appear In The Heavens. The Arrow Through The Two Stars In The Bowl Of The Big Dipper Points To The North Star. The Star At The End Of The Little Dipper.

AT 9.00 P. M., OCT. 1; 8:00 P. M., OCT. 15; 7:00 P. M., OCT. 31.

This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitude in Europe.

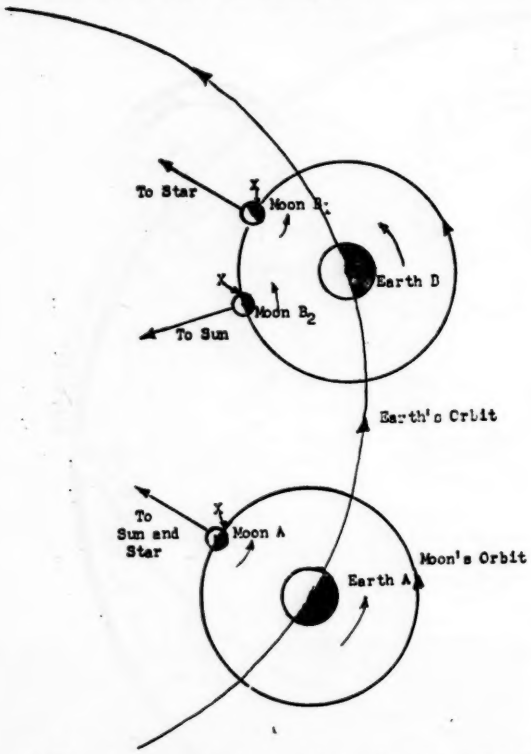
XUM

"The Coming Conquest of Space"

"The Coming Conquest of Space" was written in 1946 by Harry Akers, Jr., at the age of 12½, as a social science assignment in Balboa Junior High School, Balboa Heights, Canal Zone. It was first published in the Monthly Evening Sky Map in 1946-1948. In 1952, the author, now a student at Colorado School of Mines, Golden, Colorado, at the request of the editors of the MONTHLY EVENING SKY MAP, revised and enlarged the article by means of foot notes. The original text appears in normal type, the recently-added foot notes in italic type.

(*Continued from last issue*)

During the day and night alike the Earth appears the same—except for its phases. At full Earth, which occurs at midnight for the point exactly in the middle of the Moon's visible hemisphere, the Earth has a diameter 3½ times as great, a surface area 14 times as large, and a brilliancy 20 times as great as the corresponding values for the full Moon as seen from the Earth. The Earth would remain in the same place in the sky, while the Sun and the stars would appear to move past it. The time between the rising of the Sun and its rising again would be 29½ days, while the period between two successive risings of any star would be 271/3 days. (See diagram.)



At Moon A, the star in the direction of the Sun is rising with the Sun, as seen from point X. By the time the Moon has finished making a revolution around the Earth and a rotation on its axis (Moon B_1), the Earth and the Moon have moved, in the Earth's journey around the Sun. The star rises again, 27 1/3 days later. But the Moon must move farther on in its orbit (2.21 days' journey), in order for the Sun to rise again at the point X. (Since the Earth and Moon continue to move together around the Sun during this 2.21 day period it is evident that this diagram is an over-simplification of the actual conditions.) The time between two successive risings of the Sun at any point on the Moon is therefore 29½ days. The stars are too far away to undergo this apparent displacement as the Sun does.

With no air, there can be no "deflected light" on the Moon. On the Earth, the Earth's atmosphere scatters the rays of the Sun so that areas which are not directly illuminated by the Sun are indirectly illuminated by light reflected from the dust particles in the air. On the Moon, objects which are not *directly* illuminated by the Sun, the Earth, or the stars, are in *total darkness*, except for what light may be reflected to them from objects that are directly illuminated.

With no air, there can be no weather of any kind. Each day is the same as every other day—the only variation is that in temperatures, which is caused by the varying distance between the Moon and the Sun, and by the varying angle at which the Sun's rays strike the surface. The only things which alter its condition are meteors ("shooting stars") which strike its surface and break the rocks, or the great variation in temperature which might crack the rocks. Neither can there be any sound, for it takes air to carry sound.

The Moon, beautiful as it appears from the Earth, is a lifeless world, where the only changes are those in temperature, and where total silence prevails with not the tiniest noise to break its solitude.

The Moon, then, is a very interesting, yet not a very pleasant place. It is now time to leave the Moon, but we may be consoled by looking forward to the more interesting space voyage of the future—the trip to Mars. We have now learnel the Moon's secret—what its "other side" is like (the hemisphere which is forever turned away from the Earth.) Reluctantly we board our ship. After 24,000 miles of travelling, we have reached the "neutral point," and from there on, we are travelling towards the Earth under its gravitational pull.

> *An economical method for avoiding a seven-mile-per-second crash landing on the Earth would be to use the Earth's atmosphere as a brake. Entering the upper fringes of the atmosphere we would be deflected into an orbit around the Earth. Penetrating the atmosphere deeper and deeper on each revolution around the Earth, we would gradually be slowed down to a safe speed for landing. This method could be used for landing on any other planet which has an appreciable atmosphere.*

A TRIP TO MARS

The trip to the Moon has been made successfully, and we have proved to all but the most doubting ones on Earth that it is possible to return safely. We are now ready for the more exciting space-voyage—the one to Mars, the "land" of our dreams.

Mars, our second nearest planet neighbor, is nearest to the Earth when it is in "oposition"—exactly opposite the Sun. But its distance at opposition varies between 35,000,000 and 63,000,000 miles. The best time to go would be near one of those oppositions when Mars is at its closest point to the Sun, but as oppositions *near any one particular point of Mars's orbit* are many years apart, it would be well to go at any opposition (*oppositions* are 780 days apart), regardless of Mars's distance.

The velocity of escape from the Sun at the distance of the Earth is 26 miles per second. In order to be able to "sail" with our motors off, a speed of 26 miles per second would be necessary; otherwise we would be slowed down, stopped, and drawn back by the Sun.

(Continued from Page 2)

The trip would take between two and four weeks, depending on the distance of Mars.

We are travelling much faster than we were on our trip to the Moon, so we will have to slow down sooner.

By failing to reach the full speed of 26 miles per second, we could use the Sun's gravity as a brake, although this would greatly increase the time required for the trip.

We have landed. Mars has an atmosphere, as the Earth has; but it is almost as thin as the atmosphere of the Earth is in the stratosphere, and contains only 0.1% as much oxygen as an equal volume of sea-level Earthian air.

(Continued on Page 6)

THE STAR OF BETHLEHEM

By James Stokley

(Reprinted by request)

After centuries of study, astronomers have learned the exact times in which the various planets revolve around the Sun, and the way in which they are attracted by each other. From this knowledge, the men who designed the planetarium were able to work out very accurate gear ratios, so that the motions of the artificial planets correspond closely to those observed in the real sky over comparable periods of time. So precisely has this been done that if it is set several thousand years in the past or in the future, the difference between the planetarium and the genuine sky would be hardly perceptible to the unaided eye.

Many of the Planetaria, in this country and abroad, have taken advantage of this ability to recreate the heavens as seen at any time from any place, in order to show exactly how the skies appeared to the Wise Men at the time of the birth of Christ. Thus, by the use of this marvelous instrument, it has been possible for hundreds of thousands of people actually to view. The material in this article forms the basis of the annual Christmas demonstration in the Fels Planetarium of The Franklin Institute, Philadelphia.

Accordingly, it is possible to go back to the time of the birth of Christ, and see how the skies appeared at Palestine at that momentous date. But our first difficulty is to know what year we should choose. At first glance this seems simple. "Is this not," one might ask, "the year 1939 *anno domini—after Christ?* Was He not, therefore, born 1938 years ago?" No, we must admit, this is not the year 1938 *after Christ*, for He was born at least 1,942 years ago, and perhaps more!

First of all, it is known that Christ was born during the reign of King Herod. According to the Jewish historian, Josephus, Herod died shortly after an eclipse of the Moon. The only eclipse that could fit is one that happened on March 13, 4 B. C., so evidently the Nativity was earlier than that.

The mistake is generally blamed upon Dionysius Eriguus, said to have been a Scythian monk who was Abbot of Rome during the early part of the Sixth Century. In adjusting the calendar, he reckoned his chronological era from the birth of Christ. Before that time, years had generally been counted, in countries connected with the Roman Empire, from the founding of the City of Rome. These dates were followed by the initial A.U.C., "ad urbe condita" ("from the founding of the city").

There was a tradition, which had been stated by Clement of Alexandria, that Christ had been born in the 28th year of the reign of the Roman Emperor Augustus, and Dionysius accepted this. However, he assumed that Augustus had begun his reign in the Roman year 727. Then, the 28th year of his reign would have been 754 A.U.C., so he called this year 1 B.C. The Roman year 755 was therefore the same as 1 A.D. And this is the reckoning that we still follow.

Augustus, however, did not start reigning in 727 A.U.C., but four years earlier. He was a Roman general, named Octavius, and he had led the Roman legions in civil war against the armies of Anthony and Cleopatra. This campaign ended with a Roman victory at the Battle of Actium, which took place on September 2, 723 A.U.C. (31 B.C.) Octavius was then crowned as Emperor, and ruled for four years as Octavius, before he decided to call himself Augustus. The new title he assumed in 27 B.C., and it was this event which Dionysius mistakenly took as the beginning of his reign. Apparently the Abbot did not know that he had reigned four years already under a different name.

How much earlier than 4 B.C. Christ was born we cannot say. Some authorities place His birth during that very year, while others have put it as early as 7 B.C. In that year Saturn and Jupiter drew close together, into conjunction. In 6 B.C., early in the year, Mars joined them, and the trio, shining so closely together in the western evening sky, make a most striking and unusual spectacle.

Astrology, the belief that the position of the planets among the background of distant stars has an influence on life and activities on Earth, is now thoroughly discredited, and science has dismissed it as pure superstitution. But ages ago, before the invention of the telescope and the knowledge that it has brought, there may have been some justification for those ideas, and even the wise men believed in them. The Magi, the "wise men of the East," were really astrologers, and we can imagine them eagerly scanning the skies from their home in the valley of the Euphrates River. With no man made smoke or glare to interfere they could not have failed to notice this portent, and to try to interpret it.

Was not one of the planets in this group Saturn, which they believed to have special significance to the Hebrews? Even more important to their way of thinking, was not this grouping of planets in the constellation of Pisces, the fishes, which was a symbol of the Jewish nation? And had not the prophets written of the coming of a King of the Jews? Surely, they must have reasoned, this means some important event in Jewish history, and what could be more important than the long heralded arrival of their King?

But the planets appeared in the western sky, and the Bible says "We have seen his star in the east." This seems a contradiction, but there are several explanations. One is that the passage really means "We in the east have seen his star." The wise men were in the east, perhaps they came from Persia. If they went the same direction that they saw the star, they must have travelled to the west, in order to reach Palestine. Another possibility, accepted by many Biblical students, is that the passage means "We have seen his star in the rising." That is they had been watching these planets since they had first appeared several months before, when they were morning stars, rising in the east shortly before Sunrise. Observations had continued as the Sun moved farther away from them and they finally appeared in the west.

After this event something important really did happen in Hebrew history. But it has happened before and since. About once a century the three planets come together, and about once in 800 years in Pisces. It next occurred in 799, but without any event of special significance. It happened in 1604, when it was observed by the great astronomer Johann Kepler, whose studies gave us three fundamental laws of the motion of the planets. It was he who first suggested that the groupings might have been the original "Star of Bethlehem." It will happen again in 2408. So it seems to have been a mere coincidence that it came just before the birth of Christ.

However, there are other explanations of the Star of Bethlehem. During the last few years several "new" stars have flashed out. They are not really new, but faint stars which temporarily become many times brighter. One of these of great brilliance might have appeared in that year, and yet not have been recorded otherwise. Or a spectacular comet might have blazed across the sky. Or it might have been a fire ball, an unusually brilliant meteor, which would actually move with tremendous speed, and might leave a trail behind lasting for many minutes. And still others believe that it was a miracle, which cannot be explained on any scientific basis.

But even if they were not actually the star of Bethlehem, the planets which came together in Pisces in 6 B.C. may be regarded as a symbol of Christmas, a time when we should dedicate ourselves anew to that original Christmas message of "Peace on Earth, good will toward men."

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AMATEUR'S FORUM

By IRVING L. MEYER, M. S.

October, 1952

October 1952

THE SUN: moves through Virgo to a point on the Libra boundary. Distance is 93.0 million miles the 1st and 92.2 million miles the 31st.

THE MOON: comes to perigee (closest to the earth) twice this month; on the 1st at 225,000 miles distance, and the 29th at 228,000 miles distance. It is at apogee (farthest from the earth) the 13th at 252,000 miles.

The Moon's Phases (E. S. T.):

Full Moon	October 3 at	7:15 AM
Last Quarter	10 at	2:33 PM
New Moon	18 at	5:42 PM
First Quarter	25 at	11:04 PM

MERCURY: travels from Virgo through Libra into Scorpio. It is in the evening sky all month, but too close to the Sun to be observable. Maximum geocentric distance, the 2nd, is 131 million miles.

VENUS: is a little bit ahead of Mercury on the ecliptic, also moving from Virgo through Libra into Scorpio. Venus, however, is now pretty well placed in the evening sky, although it still sets shortly after dark. In the telescope, Venus, at magnitude -3.4, presents a disc about 11" in diameter, and appears gibbous—like the Moon a few days from full. Distance is decreasing. It is 137 million miles away on the 1st, compared with 122 million miles the 31st.

MARS: speeds from Ophiuchus into Sagittarius, in the evening sky. No longer well placed for observation, nevertheless it can be seen in the early evening. On the 1st, Mars is 119 million miles from the earth, magnitude is 0.6, diameter is 7.3", and 86% of the disc is illuminated as seen from earth. On the 31st, distance is 134 million miles, magnitude is 0.8, diameter is 6.5", and it is 88% illuminated. To see much detail on the planet's surface now, a combination of a steady atmosphere and a powerful telescope (200 diameters magnification and upwards) is required.

JUPITAR: close to the Aries-Taurus boundary, rises shortly after sunset, and is well situated for observation. It is a brilliant object to the naked eye, and extremely interesting with any sort of optical aid. On the 15th, distance is 378 million miles.

SATURN: in Virgo, is in conjunction with the Sun on the 11th, thereafter appearing in the morning sky. It is too close to the Sun all month for observation. Maximum geocentric distance of 990 million miles is reached the 11th.

URANUS: rises around midnight, in Gemini. At magnitude 6, this planet is just visible to the unaided eye under good conditions; is easy with any optical aid. Moderate magnification with the telescope will reveal its greenish, 4"- diameter disc. Distance the 15th is 1736 million miles.

NEPTUNE: enters the morning sky after conjunction with the Sun on the 14th. It is in Virgo, too close to the Sun all month to be observable. Maximum geocentric distance the 13th is 2908 million miles.

AMATEUR'S FORUM

By IRVING L. MEYER, M. S.

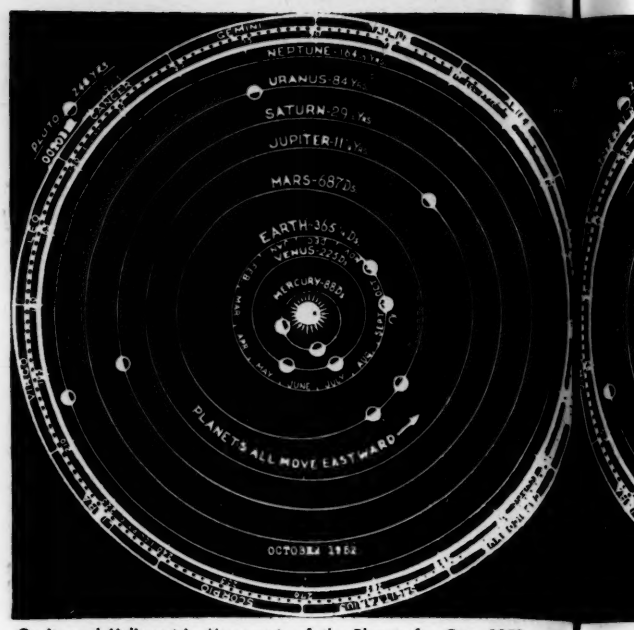
November, 1952

THE SUN: moves through Libra into Scorpio. During the month geocentric distance decreases from 92.2 to 91.6 million miles.

THE MOON: is at apogee the 10th at a distance of 251,000 miles, and is at perigee the 23rd at a distance of 230,000 miles.

The Moon's Phases (E. S. T.)

Full Moon	November 1 at	6:10 PM
Last Quarter	9 at	10:43 AM
New Moon	17 at	7:56 AM
First Quarter	24 at	6:34 AM



Orbits and Heliocentric Movements of the Planets for Oct., 1952

NOTE: The planets are shown in their respective orbits. Two positions, one for the first, and one for the last day of the month, are given for Mercury, Venus and Mars. The arrow indicates the last day of the month. Jupiter, Saturn, Uranus and Neptune are shown in the mean position for the current month.

MERCURY: is in Scorpio all month, in the evening sky until the 30th, on which date occurs inferior conunction with the Sun and Mercury enters the morning sky. On the 9th it is at greatest elongation from the Sun — 22° 59' east — and for several days before and after this date will be observable in the evening twilight, close to the western horizon. At this same time it will be close to the 1st magnitude star Antares, with Mercury to the north about 2 degrees. On the 9th magnitude is 0.0, diameter is 6½", and the planet is about two-thirds illuminated, appearing gibbous in the telescop. Minimum geocentric distance is reached the 30th at 63 million miles.

VENUS: moves from Scorpio into Sagittarius, and is wel placed for observation in the evening sky. Distance from the earth decreases from 122 to 105 million miles, with consequent increases in apparent diameter (13" to 15") and brightness (magnitude -3.4 to -3.6). It is the most brilliant starlike object in the heavens.

MARS: is a relatively puny object in the evening sky, not very far east of Venus. It is receding rapidly from the earth. It opens the month in Sagittarius, 135 million miles away, and magnitude 0.8; by the 30th it has moved into Capricornus, and distance is 150 million miles, with magnitude 1.0. It sets early in the evening and is no longer well placed for observation.

JUPITER: in Aries, is very well situated for observation as it comes to opposition on the 8th. Minimum geocentric distance, the 6th, is 371 million miles. On that date, equatorial diameter is 49.3", polar diameter is 46.0", and magnitude is -2.4. It is a very bright planet, with its four bright moons visible in opera glasses, while a moderate magnifying power on the telescope will reveal the flattening at the poles as well as the cloud bands across the face of the disc.

SATURN: in Virgo, is in the morning sky, but too close to the Sun to be observable. It is in conjunction with Neptune on the 17th, and is only alittle more than half a degree north. Distance the 15th is 976 million miles.

URANUS: is in Gemini in the morning sky. It rises well before midnight. Though it is only a 6th magnitude planet, and barely visible to the naked eye, it, nevertheless, is a bright greenish disc as seen in a 12-inch telescope. On the 15th, geocentric distance is 1690 million miles.

NEPTUNE: is in Virgo in the morning sky. It is too close to the Sun to be observable. Distance the 15th, is 2894 million miles.

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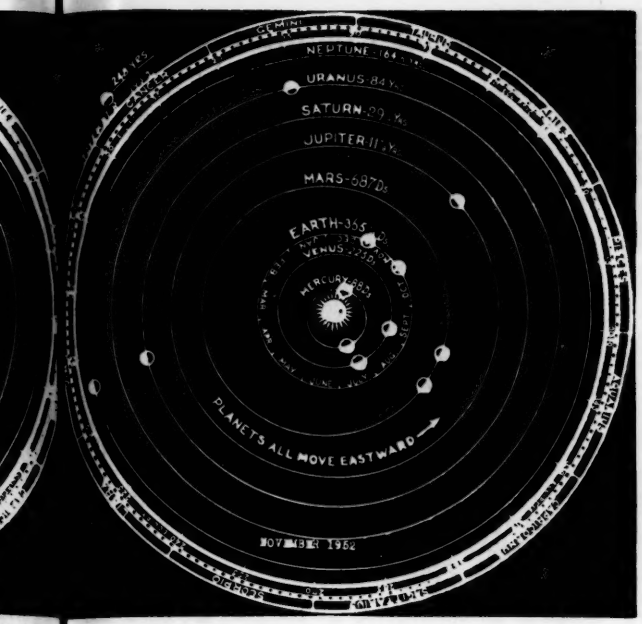

Orbits and Heliocentric Movements of the Planets for Nov., 1952

PLANETARY CONFIGURATIONS

Eastern Standard Time

October, 1952

Oct.	3 — 5:	PM	Venus in descending node
Oct.	3 — 7:	PM	Conjunction, Mercury and Saturn; Mercury south 1° 53'
Oct.	6 — 4:	AM	Conjunction, Mercury and Neptune; Mercury south 1° 29'
Oct.	6 — 5:18	AM	Conjunction, Jupiter and Moon; Jupiter south 6° 40'
Oct.	8 — 7:	AM	Mercury in descending node
Oct.	10 — 3:57	PM	Conjunction, Uranus and Moon; Uranus south 2° 19'
Oct.	11 — 3:	AM	Conjunction, Saturn and Sun
Oct.	11 — 3:	PM	Quadrature, Uranus and Sun
Oct.	14 — 4:	PM	Conjunction, Neptune and Sun
Oct.	18 —10:20	AM	Conjunction, Saturn and Moon; Saturn north 7° 15'
Oct.	18 — 2:	PM	Mercury in aphelion
Oct.	18 — 3:02	PM	Conjunction, Neptune and Moon; Neptune north 6° 40'
Oct.	20 — 5:21	AM	Conjunction, Mercury and Moon; Mercury north 3° 51'
Oct.	21 — 9:31	AM	Conjunction, Venus and Moon; Venus north 4° 11'
Oct.	22 — 3:	AM	Mars greatest heliocentric latitude south
Oct.	24 — 5:44	AM	Conjunction, Mars and Moon; Mars north 1° 25'
Oct.	24 —12:		Noon Uranus stationary in Right Ascension

PLANETARY CONFIGURATIONS

Eastern Standard Time

November, 1952

Nov.	2 — 9:54	AM	Conjunction, Jupiter and Moon; Jupiter south 6° 36'
Nov.	7 — 12:24	AM	Conjunction, Uranus and Moon; Uranus south 2° 2'
Nov.	7 — 8:	AM	Venus in aphelion
Nov.	7 — 10:	PM	Mercury greatest heliocentric latitude south
Nov.	8 — 4:	AM	Opposition, Jupitar and Sun
Nov.	9 — 10:	PM	Mercury greatest elongation east, 22° 59'
Nov.	15 — 12:44	AM	Conjunction, Saturn and Moon; Saturn north 7° 29'
Nov.	15 — 1:09	AM	Conjunction, Neptune and Moon; Neptune north 6° 47'
Nov.	16 — 10:	AM	Mars in perihelion
Nov.	17 — 9:	PM	Conjunction, Saturn and Neptune; Saturn north 0° 43'
Nov.	18 — 9:39	PM	Conjunction, Mercury and Moon; Mercury north 2° 15'
Nov.	20 — 5:	AM	Mercury stationary in Right Ascension
Nov.	20 — 6:11	AM	Conjunction, Venus and Moon; Venus north 1° 14'
Nov.	22 — 12:28	AM	Conjunction, Mars and Moon; Mars south 0° 14'
Nov.	26 — 10:	PM	Mercury in ascending node
Nov.	29 — 12:28	PM	Conjunction, Jupiter and Moon; Jupiter south 6° 36'
Nov.	29 — 1:	PM	Venus greatest heliocentric latitude south
Nov.	30 — 6:	AM	Inferior conjunction, Mercury and sun;

THE DISTANCE OF THE STARS

From Astronomical Notes, of New Zealand, by

A. G. Crust, M. Sc.

The first method of measuring star distances was the trigonometrical method used by the German astronomer, Bessel, who found the distance of the star 61 Cygni. This method is based on the fact that the earth, moving in its elliptical orbit around the sun, must make the nearer stars appear to describe small ellipses in the heavens, the sizes of these small ellipses being inversely proportional to the distances of the stars. The diameter of the earth's orbit being 186,000,000 miles, Bessel considered that with his instruments the small ellipse described by at least a few stars ought to be detected, and so accordingly he succeeded in measuring that of the double star 61 Cygni, which came out at 0.29 sec of arc. Later the southern star, Alpha Centauri, was measured by Henderson in South Africa in this way, the "parallax," or major semi-axis, of this little ellipse being 0.76 sec of arc. So exceedingly small are these parallactic ellipses that they indicate very great distances. When we say that the "parallax of Alpha Centauri is 0.76 seconds of arc, it really means that the track of a planet revolving round the star at a distance of 92,800,000 miles—the same as our distance from the Sun—would subtend the small angle of 0.76 seconds of arc as seen from the earth. If Alpha Centauri had such an attendant, even one as bright as itself, no telescope less than 9 in. in diameter would be able to show the two bodies clearly separated. It speaks well for modern instruments that not only this, but much smaller parallaxes, can be accurately determined.

The parallax must be determined before the distance can be stated. The distance of Alpha Centauri in miles is about twenty billion, one billion being one million millions. The mile is so ridiculously small a unit that others have been devised for making clear these great distances. Just as we would not expect a carpenter to measure a door in fractions of a mile, or a railway time-table to state the distance from station to station in inches, we cannot expect the astronomer to express his longest distances even in the largest units used on the earth.

The new units for stellar distances are as follow:

1 astronomical unit equals 92,800,000 miles.

1 light year equals 63,290 astronomical units (or six billion miles).

1 parsec equals 3.259 light years.

The first of these units is constantly used within the solar system, the other two being used outside it. It is really the celestial inch, for no smaller unit is used except in very restricted cases. Remembering that one English mile is 63,360 inches, we may call the light year the celestial mile. Light, which covers the distance from the Sun to the Earth in 8 min. 17 scc., covers six million million miles in one year, and this distance is the light year. The parsec is the celestial league, and is greatly in favor, especially in America, and in work on the longest distances so far measured. The parsec is the distance from which a star has a parallax of one second of arc; hence the name. As the parallax is always given as a decimal of a second of arc, we obtain distances in parsecs by taking the reciprocal of the parallax. Thus the bright star in the Southern Cross, Alpha Crucis, has a parallax of 0.02 seconds of arc; therefore its distance is 50 parsecs or 160 light years.

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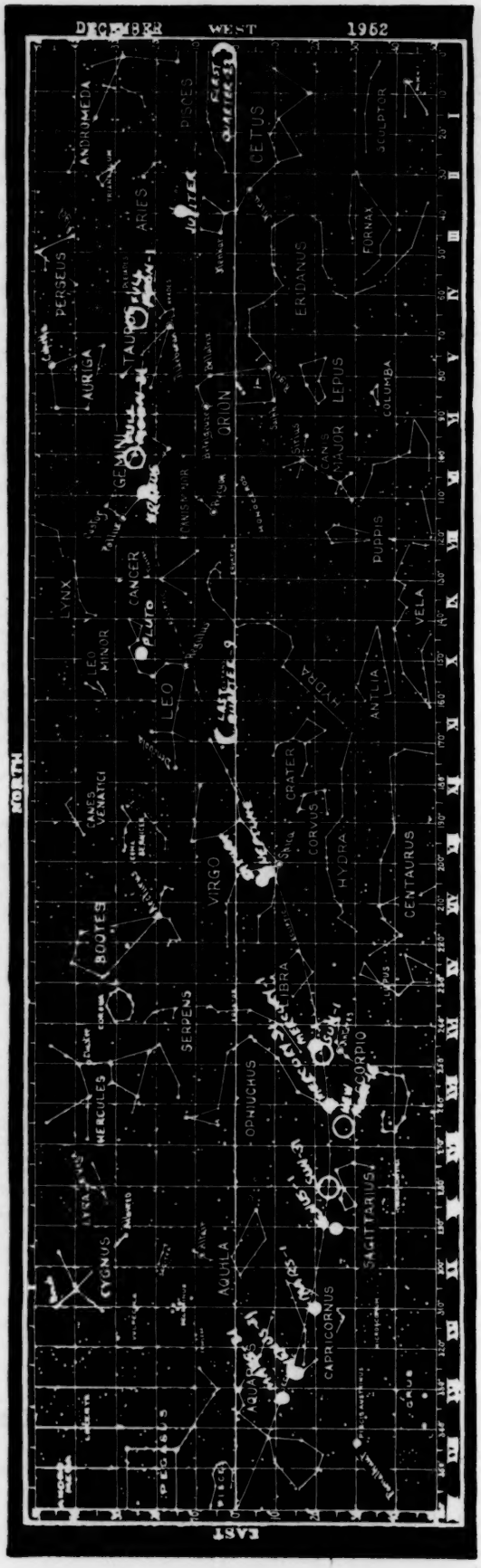

A MERCATOR PROJECTION OF THE STAR FIELD FOR 50 DEGREES NORTH AND 65 SOUTH OF THE EQUATOR

The Star Field makes an apparent complete revolution westward every 24 hours, hence the hourly division from I to XXIV, but this has no relation to the time that any portion of the map is in view
Practical as a Star, Constellation and Planet Finder for the current months—October-November-December, 1952—Anywhere in the World.
Showing also the position of the Sun at the beginning and ending of the month and the position of the Moon at its several phases

"The Coming Conquest of Space"

(Continued from Page 3)

THE ORBITS OF THE EARTH AND MARS

An opposition in August would be the most favorable for a quick trip to Mars, for then Mars is near perihelion, closest to the Sun, and the Earth is near aphelion, farthest from the Sun. If an opposition occurs between May 7th and May 15th, the Earth will be seen to pass across the Martian Sun from south to north. If an opposition occurs between November 7th and November 14th, the Earth will pass across the Sun from north to south. At other oppositions, the Earth passes the Sun to the north or to the south. For the Northern hemisphere, summer begins at D, near aphelion, and winter at B, near perihelion. The Southern hemisphere is less fortunate. It has its summer when the planet is closest to the Sun and its winter when the planet is farthest from the Sun.

We are in the midst of a great desert. The sands are mixed with a reddish substance—it is iron rust!! Iron rust covers the entire desert, and gives Mars its ruddy color. This is also why Mars's atmosphere has lost its oxygen—when iron rusts, it unites with oxygen. Mars's oxygen has been used up, and is now a part of the iron rust which covers the surface. We would find it impossible to try to compress the Martian atmosphere for our own use, for the gases are not mixed in a proportion similar to that in which the gases in the Earth's atmosphere are mixed—for example, Mars's atmosphere contains 0.05 as much water vapor, but only 0.001 as much oxygen as an equal volume of sea-level Earthian air. We will have to use the method of getting air that we used on the Moon; we will also have to have suits to keep pressure on the outside of our bodies the same as that on the inside.

The skies of Mars present to us a much more interesting spectacle than the skies of the Earth. Mars has two small moons. The inner one, Phobos, rises in the West, and 5 1/2 hours later has set in the East. The period of its phases is only about 7 hours. The outer one, Deimos, rises in the East, and does not set in the West again until two Martian days have gone by. (A Martian day equals 24 hours and 40 minutes.) On one typical night, Phobos might pop above the Western horizon just as the Sun was setting, and set before midnight in the East where slow-moving Deimos had just risen. Before sunrise, Phobos could rise again, and could make a total of three risings and two settings (or vice-versa) in one Martian day.

The diameter of Phobos is only ten miles, but, because of its nearness to Mars, its apparent diameter is about 1/3 that of the apparent diameter of the Moon as seen from the Earth. Deimos's apparent diameter is about 1/20 that of the Moon. There are often eclipses of the Sun by the satellites, but they are too small to completely cover it. The apparent diameter of the Sun as seen from Mars is about 2/3 that of the Sun's apparent diameter as seen from the Earth. Phobos could cover 1/2 of the Sun's diameter, and Deimos could cover about 1/14. Mars's shadow often cuts off the Sun's light from its satellites, and then eclipses of those satellites are observed from Mars. Phobos can be eclipsed twice in one night, for it can be full twice in one night (*), and Deimos can be eclipsed once too.

Phobos, which is nothing more than a large rock, is no farther from the surface of Mars than New York is from Los Angeles. Mars occupies a large part of this moon's sky, and is so close to Phobos and so large in comparison to its distance that only its tropic and temperate latitudes (about 2.3 of a hemisphere) are visible. If a war were taking place on Mars, an observer on Phobos could

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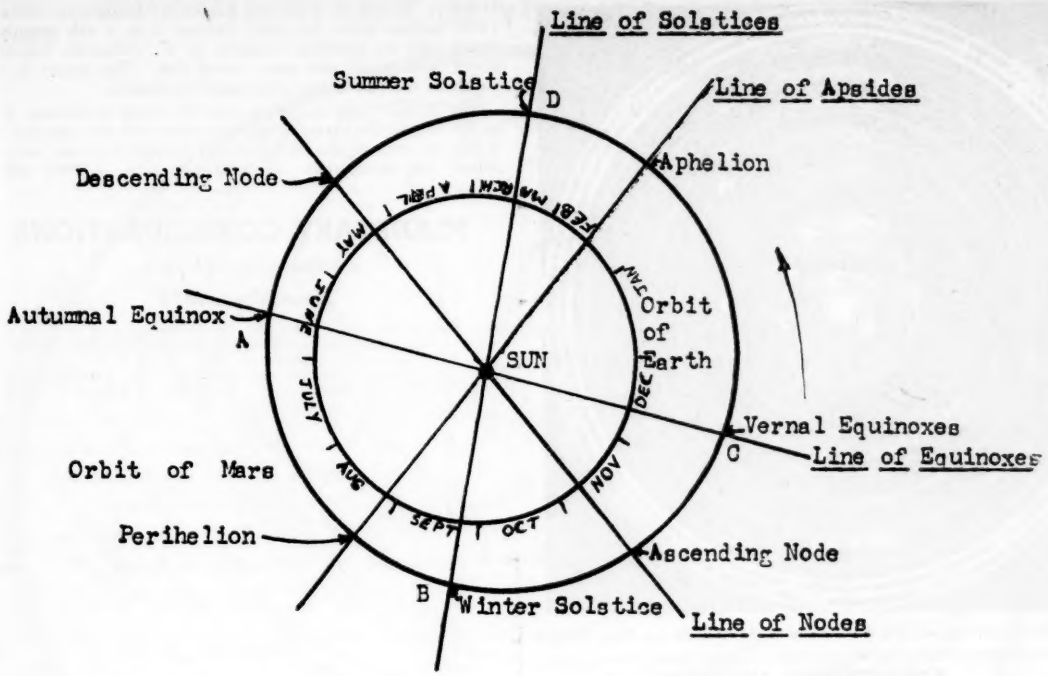


report on the position of the enemy several times daily (once during each of Phobos's seven-hour-long flying trips around Mars,) using only a moderately powerful telescope for observation. Records for baseball pitching could be set easily on Deimos. A ball pitched in the direction of Mars could reach the velocity of except of tiny Deimos, pass the neutral point, and eventually arrive on Mars, over 12,000 miles away.

The temperatures on Mars are, of course, much lower than those on Earth. The highest temperature is reached at noon, when, in the tropics, it may be as "hot" as 50 or 60 degrees F. But, at midnight, the temperature drops to -80 or -100. The region near the South Pole suffers a temperature of -145 during its long winter night.

We may expect to find plant life on Mars. Some astronomers have suggested that evergreen trees might live there, because infra-red photographs of some parts of Mars are similar to infra-red photographs of evergreen forests on Earth. It seems rather improbable that anything so complex as a tree could exist under the atmospheric and temperature conditions of Mars, however. Plant life would have to be much simpler than trees in order to survive on Mars.

The basis for the assumption that life exists on Mars is the result of direct observations of the planet. Mars has two white polar caps, similar to those on Earth. It was once thought that these caps were frozen carbon dioxide, but now it is almost certain that they are made of ice, probably a form of ice similar to hoarfrost, and are probably not more than a few inches thick. As summer advances in either hemisphere, the cap on the corresponding pole begins to shrink, while the opposite cap grows. It is then that an interesting thing happens. While water is moving across the temperate and tropic zones of Mars (probably as vapor through the atmosphere) during its journey from one pole to the other, an area in the tropic and temperate zones changes from brown to green. *This area, known as the* Syrtis Major, *changes back to brown again as soon as winter and summer have firmly established themselves in their respective hemispheres. When the situation reverses, and water again passes through the air over the tropic and temperate zones, the Syrtis Major becomes green again. The logical explanation for this phenomenon is that the Syrtis Major is an area supporting a form of green plant life which can extract water from the air. The only seasons during which these plants can grow are spring and autumn, since the planet's water supply is tied up either at one pole or at the other during the other seasons.*

There may be *low* forms of animal life on Mars, like insects or one-celled animals, but even *they* would be interesting. The system of so-called "canals" on the surface of Mars, which was thought to be the work of intelligent beings in a last attempt to make the planet's decreasing water supply "go around" *does not exist.* There is no doubt about the fact that the larger "canals" exist, but the intricate network of canals running in all directions, joining oases, as described by Percival Lowell in the 1880's, was an optical illusion.

The fact that the larger "canals" do exist is a mystery. They are far too straight to be either rivers or volcanic fissures. They have a decided "man-made" appearance. Yet, as far as we know, no intelligent form of life could exist in an atmosphere with practically no oxygen. The nature and origin of these "canals" would be a problem for the explorers to solve. A few other interesting geographical features on Mars have been noted recently. A record high temperature of 72° F. was observed on Mars in 1949. A huge "explosion" was seen in 1949, comparable in size to that predicted for a hydrogen bomb; the "explosion" was explained as a large desert sand storm. Mars appears to have one mountain, near its south pole. As the south polar cap shrinks during its summer season, a small area a short distance from the pole separates from the rest of the cap and remains ice-covered.

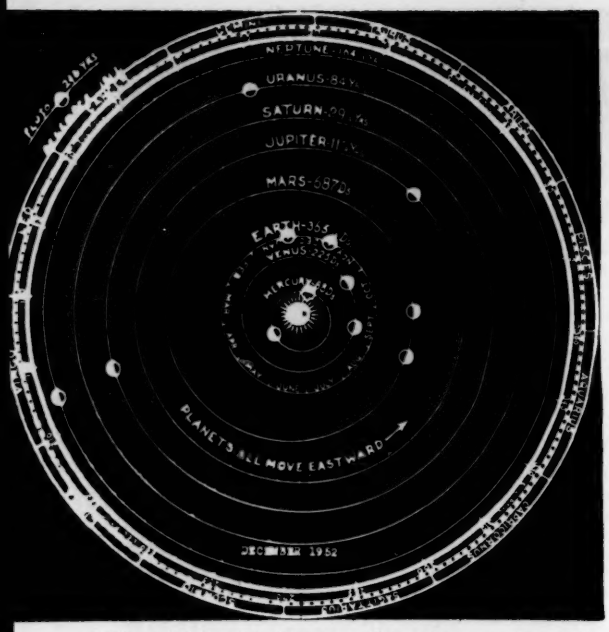
To be continued next issue.

CHRISTMAS GREETINGS

Here's my sincere best wishes for a joyous Christmas season.

May abundant good fortune be yours throughout the years ahead.

Mrs. Leon Barritt, Editor



Orbits and Heliocentric Movements of the Planets for Dec., 1952

AMATEUR'S FORUM

By IRVING L. MEYER, M. S.

December, 1952

THE SUN: travels from Scorpio into Sagittarius. It enters the *sign* of Capricornus on the 21st, marking the Solstice—the advent of winter in the northern hemisphere. Distance decreases from 91.6 million miles to 91.4 million miles.

THE MOON: is at apogee (farthest) on the 7th, at 251,000 miles, and is closest (perigee) the 19th, at 227,000 miles.

The Moon's Phases (E. S. T.):

Full Moon	December	1	7:41 AM
Last Quarter		9	8:22 AM
New Moon		16	9:02 PM
First Quarter		23	2:51 PM
Full Moon		31	12:05 AM

MERCURY: moves from Scorpio into Ophiuchus in the morning sky. It reaches greatest elongation west of the Sun, 21° 37', on the 18th, and for about a week around that date will be visible in the dawn-lighted sky just above the eastern horizon. Magnitude will be -0.1, apparent diameter 7", and it will be a little better than half illuminated as seen from the earth, so that in the telescope it will appear much like the Moon at quarter phase. Distance increases from 63 to 115 million miles during the month.

VENUS: moves from Sagittarius through Capricornus to its eastern edge. It is now assuming prominence in the evening sky, and as it climbs northwardly along the ecliptic ahead of the Sun it becomes still better situated. Even though the planet's illuminated surface, as seen from the earth, diminishes from 75% to 65% (appearing gibbous in the telescope), still magnitude increases from -3.6 to -3.8, as a result of a decrease in geocentric distance from 105 to 86 million miles.

MARS: moves in the evening sky from Capricornus into Aquarius. It is now only about as bright as a standard first magnitude star, and makes a puny companion for the nearby Venus. Distance increases from 150 to 166 million miles.

JUPITER: in Aries, is well situated for observation in the night sky. It is only shortly past opposition, and as a result does not set until near dawn. It is a brilliant planet, second only to Venus, and will well repay in interest observation with any optical aid. Distance the 15th, is 391 million miles.

SATURN: is in Virgo in the morning sky all month, and now rises sufficiently ahead of the Sun to permit satisfactory observation. Users of even moderate sized telescopes will be able to make out the unique ring system, as well as the brightest satellite, Titan. On the 15th, magnitude is 0.9, ring diameter is 37", equatorial diameter of the planet is 16 1/2", and distance is 944 million miles.

URANUS: rises shortly after sunset. It is in Gemini, very well placed for observation, as it will come to opposition in January. Though it is a huge planet, its tremendous distance (1659 million miles the 15th) reduces it to a 6th magnitude object with an apparent diameter of 4". Moderate telescopic power will reveal this neat, round disc. The planet is just visible to the naked eye under good conditions.

NEPTUNE: also in Virgo, and very close to Saturn. It is an 8th magnitude planet, not observable with the unaided eye. It can be seen in the morning sky, though it is not yet well placed for observation. Distance the 15th, is 2861 million miles.

PLANETARY CONFIGURATIONS

Eastern Standard Time

December, 1952

Dec.	1 —	1:	PM	Mercury in perihelion
Dec.	4 —	7:54	AM	Conjunction, Uranus and Moon; Uranus south 1° 52'
Dec.	9 —	8:	PM	Mercury stationary in Right Ascension
Dec.	11 —	8:	PM	Mercury greatest heliocentric latitude north
Dec.	12 —	12:01	PM	Conjunction, Neptune and Moon; Neptune north 7° 0'
Dec.	12 —	3:17	PM	Conjunction, Saturn and Moon; Saturn north 7° 48'
Dec.	15 —	8:53	AM	Conjunction, Mercury and Moon; Mercury north 7° 28'
Dec.	18 —	5:	PM	Mercury greatest elongation west, 21° 37'
Dec.	20 —	2:38	AM	Conjunction, Venus and Moon; Venus south 2° 3'
Dec.	20 —	9:21	PM	Conjunction, Mars and Moon; Mars south 2° 12'
Dec.	21 —	4:44	PM	Sun enters Capricornus; Solstice
Dec.	26 —	3:17	PM	Conjunction, Jupitar and Moon; Jupiter south 6° 39'
Dec.	31 —	1:47	PM	Conjunction, Uranus and Moon; Uranus south 1° 52'

ORIGIN OF THE MOON'S CRATERS

Some years ago Dr. E. G. Davis, a well-known Kansas City physician, advanced the theory that the craters on the moon were not the result of metoric impact or volcanic action, but were formed in a similar manner to the coral atolls in our tropical oceans. This interesting and plausible theory has received marked consideration by professional astronomers in this country and Europe, and in the absence of a positively known origin of the craters, stands at least on a par with the others.

Dr. Davis, who was president of the Kansas City Astronomical Society, broadcasted several popular lectures on astronomy, from a local radio station in which he explained his theory of the origin of the moon's craters, and aroused no little interest among his hearers.

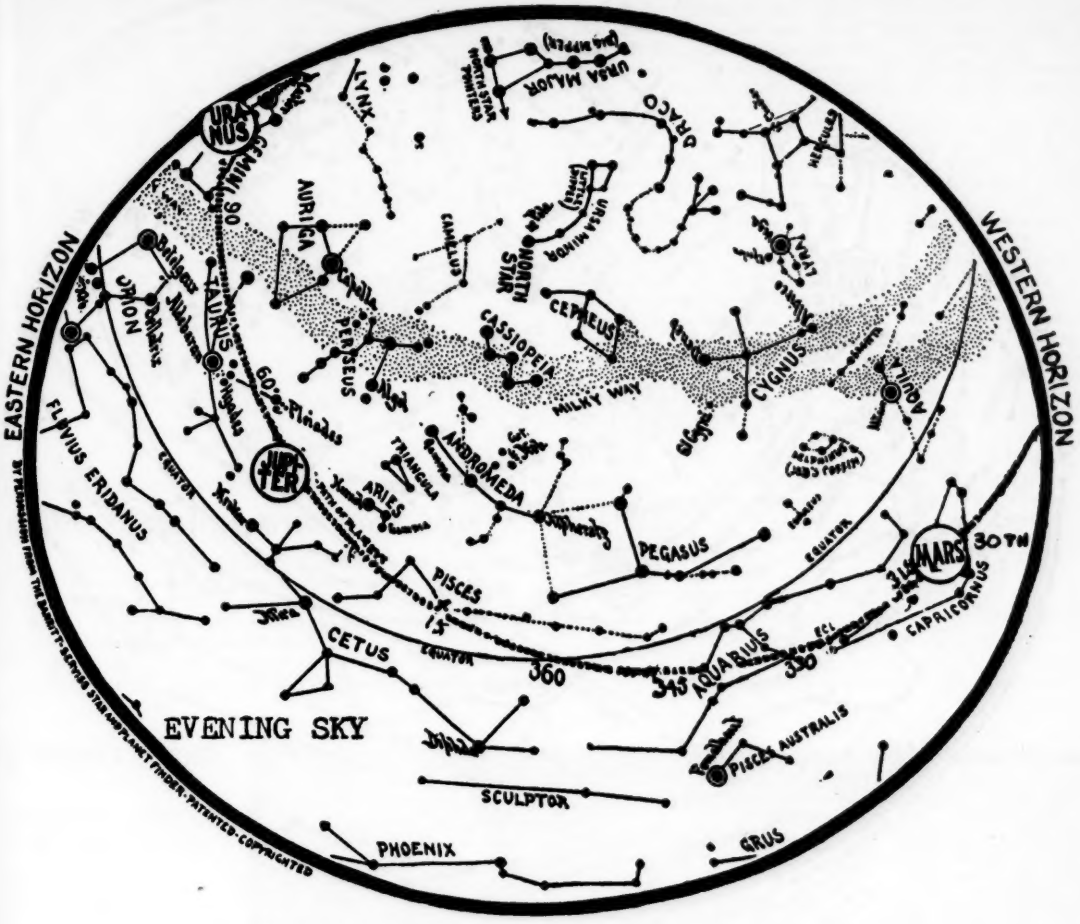
His theory is that "Rings in trees, teeth, bone, horns, reefs and coral island reefs are records of organic growth, and that what we see on the moon is limestone formation, and that the moon's surface is really the bed of ancient seas, in which coral atolls were formed by lime accretions."

The Doctor in one of his radio addresses said: "In the northern hemisphere of the earth the white limestone formation comprises the Eozoic limestone thickness unknown, but great. The lower Silurian limestone thickness, 20,000 ft.; upper Silurian limestone 15,000 ft.; Devonian limestone, thickness, 14,000 ft.;Carboniferous limestone, 16,000 ft.; Permian limestone, 10,000 ft.; Mississippi limestone, 400 to 26,000 ft. thick, constitute the greatest monument upon our earth. Every grain of which has not been produced by either volcanoes or projectiles, but by the bone cell of life, chiefly in the seas of the earth. The same may be said of the phenomena and structure of the white formations on the moon.

The whole of the white limestone formation of the earth, and the whole of the white limestone formation of the moon are but two great world fossils chiefly of the sea bone making life of two worlds."

THE PUBLISHER OF THE MONTHLY EVENING SKY MAP will appreciate the kindly interest of its subscribers in sending the names of those whom they think would be interested in the study of the "STARS," we will take great pleasure in sending them sample copies.

EVENING SKY MAP FOR NOVEMBER



AT 9:00 P. M., NOV. 1; 8:00 P. M., NOV. 15; 7:00 P. M., NOV. 30.

NOVEMBER EVENING SKIES

The Pleiades, the advance guard of the array of constellations that make the Winter evening skies so magnificent, are now coming into view in the early evening sky in the east. Just below is the bright red star Aldebaran, which when seen through the telescope has the appearance of a scintillating jewel. Orion, the grandest group of stars in the sky, is creeping up on the horizon and later in the evening will be finely in view. Gemini, with its twin star Pollux and Castor, is also just rising on the northeastern horizon.

The "Big Dipper" is now so low on the northern horizon that unless one has a low, clear sky, it cannot be well defined. Andromeda and Pegasus are directly overhead. A low-power telescope, or an opera glass will show the famous nebula in Andromeda. Its position is given on the map for the Evening Sky and when once found it can easily be located on a clear night with the naked eye. Cassiopeia is also in the zenith and can be distinguished by its marked resemblence to the letter "W".

To the east of Cassiopeia is Perseus, a most interesting and beautiful group of stars to view with a low-power telescope. In this group is the celebrated variable Algol.

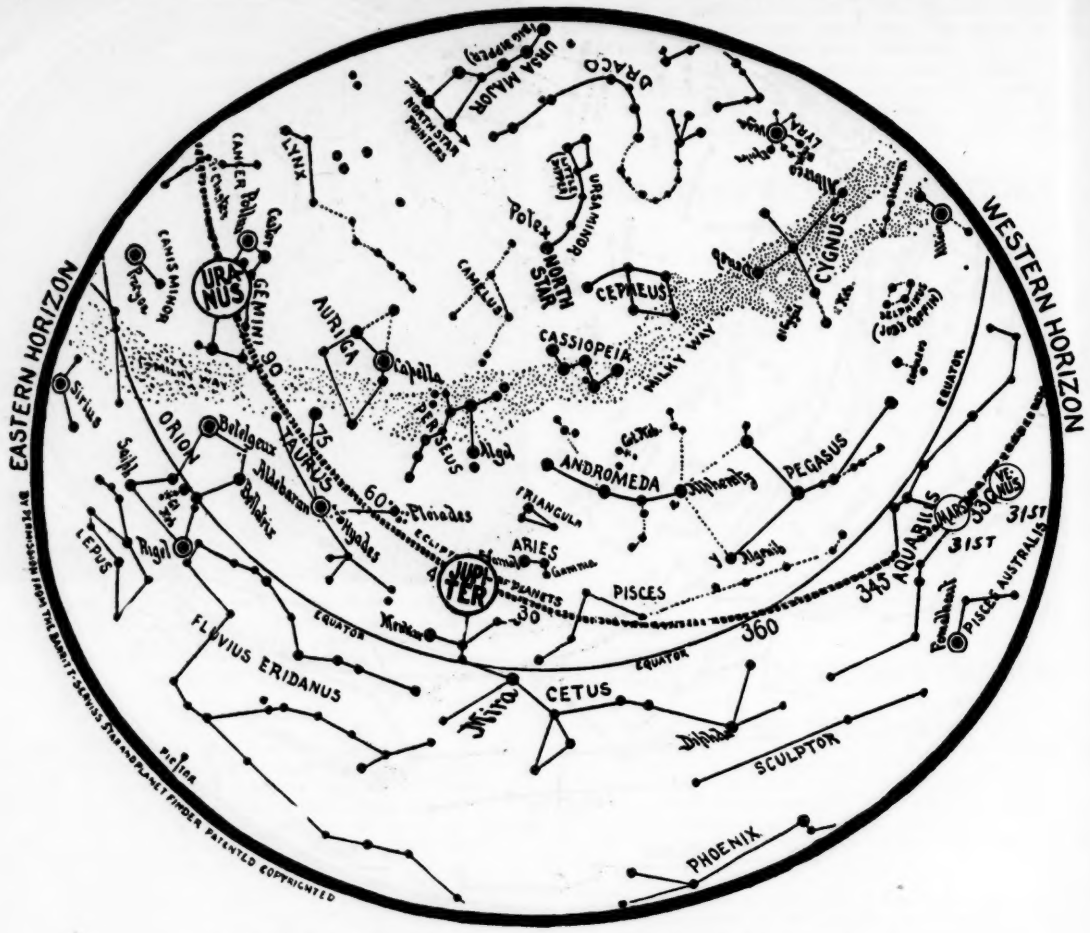
Another remarkable variable star commands attention this month—Mira, "the wonderful," in the constellation Setus. Generally it is only of the fourth magnitude when at maximum. At minimum it disappears entirely from the naked eye, sinking to the eighth magnitude. It is probable that the variabilty of Mira arises from an entirely different cause than that concerned in the case of Algol. Instead of being due to eclipses, the variations of Mira's light no doubt originate from something in the constitution of the star itself. In the northeast below Perseus glitters the brilliant Capella in the constellation Auriga, and Vega scintillates in the northwest, a worthy rival of Capella in the northeast.

November is the great month for meteors, two famous showers falling within its limits. The first of these is the shower of the Leonids, so called because the meteors radiate from the head of the lion in the constellation Leo. They are due on the 14th or 15th, and to see them one must get up in the early morning hours, as Leo does not rise before midnight.

These meteors were wonderfully numerous in 1833 and 1866. but since then they have not been seen in such vast numbers. It has been shown that the planets Jupiter and Saturn have drawn most of them aside from the orbit which they formerly pursued.

The other meteor show is that of the Andromedes, due on the night of the 23rd. They radiate from the constellation Andromeda, and are associated with Biela's comet, which disappeared in the first half of the nineteenth century.

EVENING SKY MAP FOR DECEMBER



AT 9.00 P. M., DEC. 1; 8.00 P. M., DEC. 15; 7.00 P. M., DEC. 30.

This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitude in Europe.

THE HEAVENS IN DECEMBER

The dragon, Draco, is now due North; Bootes and Hercules being directly underneath, and partly below the horizon. The Great Bear has moved to the North-East, the tail hanging down. The Little Bear is still below the Pole Star, and above Draco. Between the North-East and the East Leo will be seen nearly above the horizon, with its brilliant star *Regulus*, the lion's heart. Observe the sickle group in this constellation, Regulus being at the handle. In the East, and exactly between the horizon and the zenith will be seen the two conspicuous stars belonging to Gemini; and above these, and nearly overhead, is Auriga with its bright Canella. Procyon, in Canis Minor, is below the Twins between the East and the South-East; while between Procyon and Leo is the small constellation of Cancer the crab. Canis Major, the great dog, is rising in the South-East, the principal star *Sirius* will be seen sparkling with great brilliancy. Orion is nearly standing upright between the South and the South-East; below it is the small constellation of Lepus, the hare. To the right and above Orion is Taurus, the bull, the second constellation of the Zodiac; *A'debaran* represents the eye of the bull, the stars and the two horns. The beautiful cluster of stars called the *Pleiades* forms part of this constellation; six stars are distinctly seen, though more are visible with good eyesight—Fig. 3 is a view of this cluster as seen with a small telescope. This celebrated group of stars is mentioned by Job, and there is another instance of its being noticed 3,400 years ago. Near Aldebaran another group will be noticed, but not so conspicuous as the Pleiades, this is called the Hyades.

Above Cetus is Aries the first constellation of the Zodiac.

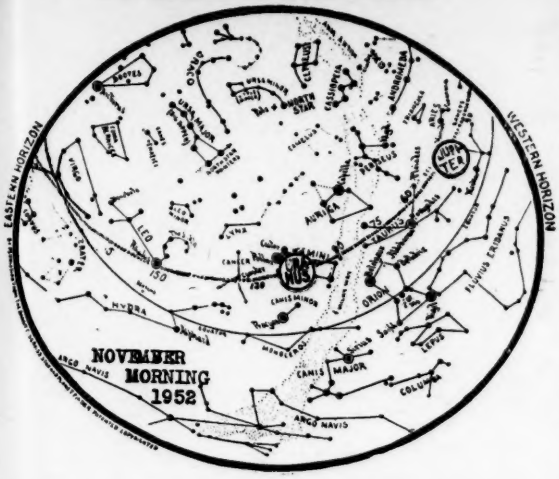
Manilius thus describes it:—

"First Aries, glorious in his golden wool,

Looks back and wonders at the mighty bull."

More than 2,000 years ago the middle of this constellation was on one of the Equinoctial Points (*i.e.*, the points where the Equinoctial cuts the Ecliptic), from which it has been called "the first point of Aries"; but owing to the precession of the Equinoxes, or the motion of the axis of the earth round a perpendicular to the Ecliptic, the Equinoctial Points have moved to the right on the Ecliptic about 30 degrees, which gives the whole heavens an apparent motion round the pole of the Ecliptic in about 25,900 years. Thus Aries 2,000 years ago occupied the same position with regard to the Equinoctial as Pisces now does, but since then it has *apparently* moved to the left a whole sign; so that the *constellation* of Aries is now in the *sign* of Taurus, Taurus in Gemini, etc.

NOVEMBER MORNING SKIES



AT 5:30 A.M. Nov. 1; 4:30 A.M. Nov. 15; 3:30 A.M. Nov 30

SPECIAL COMBINATION OFFER BEFORE XMAS

No. 1—Two year's subscription to the Monthly Evening Sky Map, $3.50; one Barritt's Star and Planet Finder, with book of Planet Tables, and Planet Disks, $7.00, one Barritts' Celestial Album containing 160 photographs, $5.00; one book, Romance of the Astronomers, $1.00, total $16.50. All can be obtained as a special gift to any of your friends for $11.00

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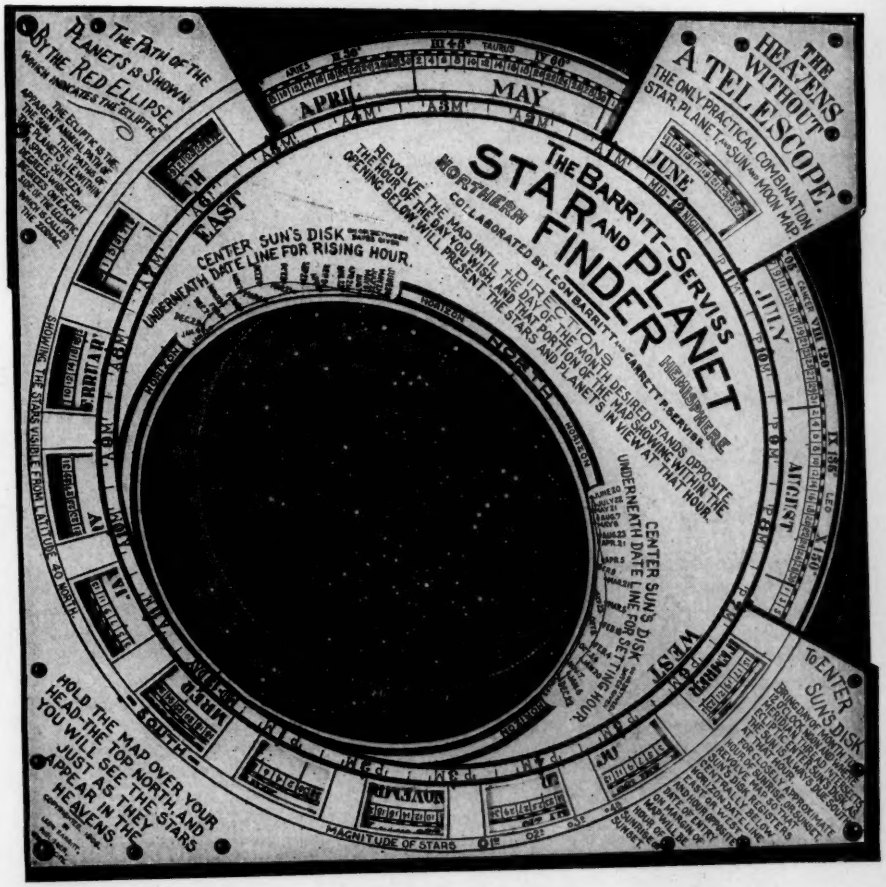
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THE MONTH DESIRED STANDS OPPOSITE
EAST
WEST
SOUTH
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APRIL
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SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH

XUM

MEMBALIMAN
CAPELLA
ALGOL
PERSEUS
AURIGA THE CHARIOTEER
NATH
TRIANGULUM
PLEIADES
TAURUS THE BULL
ALDEBARAN
HAMAL
ARIES THE RAM
CASTOR
POLLUX
LYNX
CANCER
THE CRAB
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CANIS MAJOR THE GREATER DOG
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HYDRA
ALPHARD
THE LION
THE WATER SNAKE
THE RIVER
EAST
SOUTH
WEST
STARS OF A WINTER NIGHT

XUM